

Ocean & River Instruments Products Guide

Ocean & River Instruments Division
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(Formerly: JFE Alec Co., Ltd.)
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Ocean & River Instruments Division
 **JFE Advantech Co., Ltd.**

Ocean & River Instruments Division

Company Profile

Established	Nov. 14, 1973 Spun off from Kawasaki Steel Corporation (currently JFE Steel Corporation).
Capital	319,500,000 yen (98.6% owned by JFE Steel Corporation)
President	Masahisa Kasai
Employees	255 (as of April 1, 2010)
Annual sales	5 billion yen (for entire group)

Ocean & River Instruments Division Sales Office Locations

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Ocean & River Instruments Division History

1973, September Established Alec Electronics Co., Ltd. in Moto-machi, Chuo-ku, Kobe.
1979, May Moved to Hatoba, Chuo-ku, Kobe
1985, April Started sales of Alec brand ocean measurement instruments with instruments such as the electromagnetic velocity meter and water and salinity (CTD) profiler.
1986, September Opened the Tokyo Sales Office.
1987, September Moved to 7-11 Oishikita-machi, Nada-ku, Kobe
1990, May Merged with Aanderaa Japan, Ltd.
1995, January Damaged by Great Hanshin Earthquake.
1996, July Moved to 7-2-3 Ibukidai Higashi-cho, Nishi-ku, Kobe
1998, September Acquired ISO 9001 (Quality Management System) certification
2003, September Opened office in Tsingtao, China.
2008, September Changed name to JFE Alec Co., Ltd.
2010, April Merged with JFE Advantech Co., Ltd. Started activities as Ocean & River Instruments Division, JFE Advantech Co., Ltd.



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Fast-responding optical DO sensors

RINKO

Our new proprietary DO sensors significantly advance water quality measurement in the field.

Making high-speed DO profile observation a reality

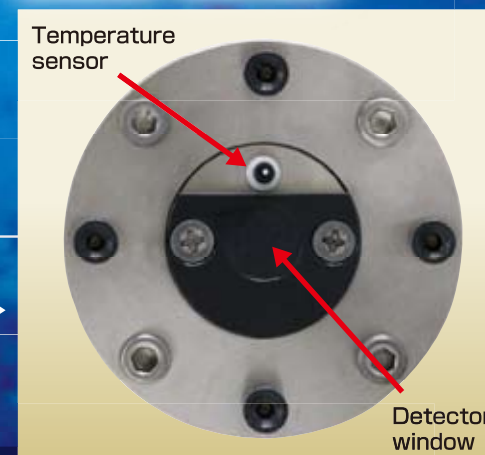
Our new RINKO DO sensors not only significantly shorten your work time, but also make it possible to acquire more detailed vertical distributions not acquirable to date.

Galvanic electrodes

- Slow response time
- Requires highly frequent maintenance



RINKO



FEATURES

Fast response time

(90%) < 1 second

Resolution < 0.01%

Easy maintenance

Until now...

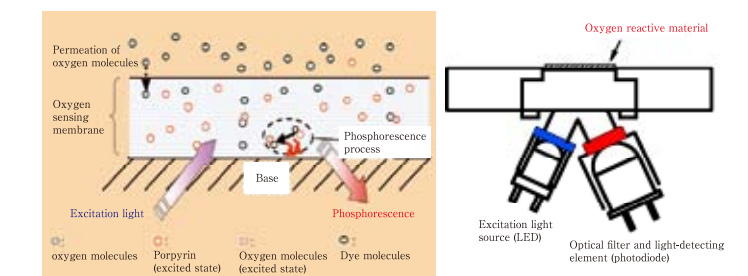
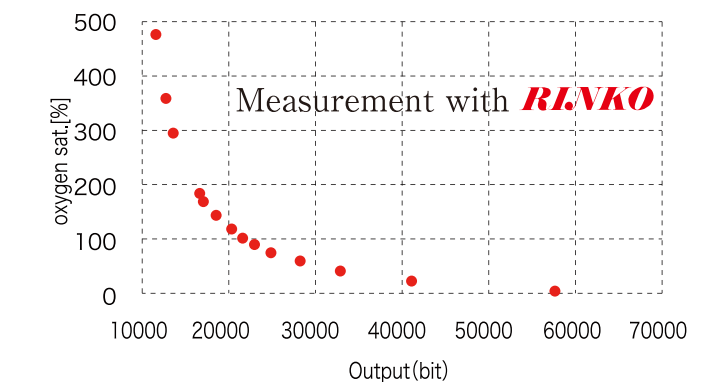
Diaphragm type galvanic electrode sensors have been used for many years for measuring dissolved oxygen in the field. These devices, however, have a slow response time, exhibit poor long-term stability, require replacement of the membrane at relatively high frequency, and are problematic in numerous applications, such as water sample agitation, thereby increasing the burden of the observer.

The RINKO series...

Our fluorescent (phosphorescent) type DO sensors achieve a high 90% response time within one second*. While the slow response time of the sensors to date made it necessary to keep the DO sensor at the measured water depth for a certain amount of time, our new product allows you to continually take vertical measurements at a drop velocity of 0.5m/second, similar to CTD observations.
*Standard value of response time in a gaseous atmosphere (25°C at 1 atm)

Measurement principle and features

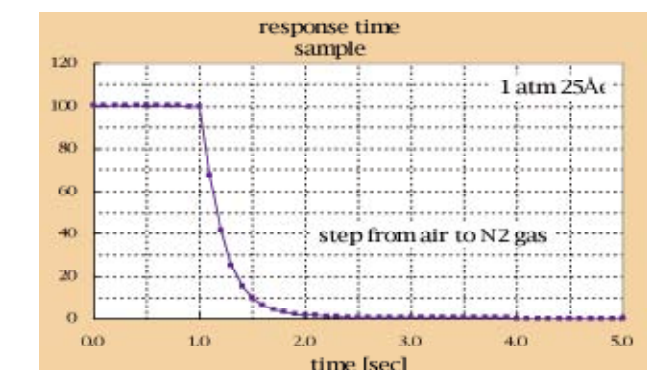
A special luminescent (phosphorescent) substance is applied to the outside of the pressure resistant acrylic window of the RINKO DO sensor. When an excitation pulse beam is emitted onto this substance, red phosphorescence is produced. The intensity of this red phosphorescence has an inverse correlation with the oxygen partial pressure (concentration) in the water. (See the figure below.)



The phosphorescence intensity is highest under an anoxic environment. Any existing oxygen molecules obstruct the emitted light, causing the phosphorescent intensity to decrease. This relationship is seen not only with phosphorescence intensity, but with phosphorescence time (life) as well. RINKO detects the length of the phosphorescence life using the phase difference detection method. The length of the phosphorescence life, unlike phosphorescence intensity, is not impacted by factors such as fouling on the sensor surface, and thus enables long-term measurement stability with the phase difference detection method. Additionally, since oxygen molecules are not consumed in the phosphorescence emission process, processes such as agitation of the sample water that were required with galvanic electrode sensors are no longer necessary.

◆Response Time

The following figure shows the change that occurs when RINKO is exposed to an oxygen partial pressure of 0 (N₂ gas: 100%) after being in air. The graph shows that a 90% response time is achieved within one second.



*63% response < 0.4 seconds *90% response < 1 second

◆Specifications

Measurement range	0 - 200 % [0 - 500μmol/l]
Resolution	0.01% to 0.04%
Accuracy	±2%(Linearity)
Response time	< 1 second (90% response)

Miniature logger-type DO meter

RINKO I / ID

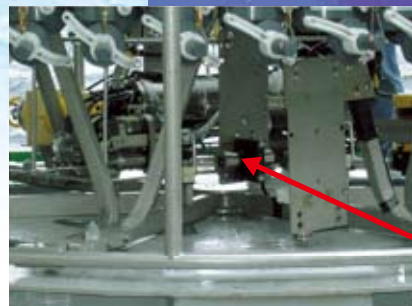
DO Temperature Depth

NEW



Deep-sea model
ARO-USB

Profile model
ARO1-USB



RINKO I mounted on
sample bottle

(Images provided by Uchida, Ocean R & D mechanism.)

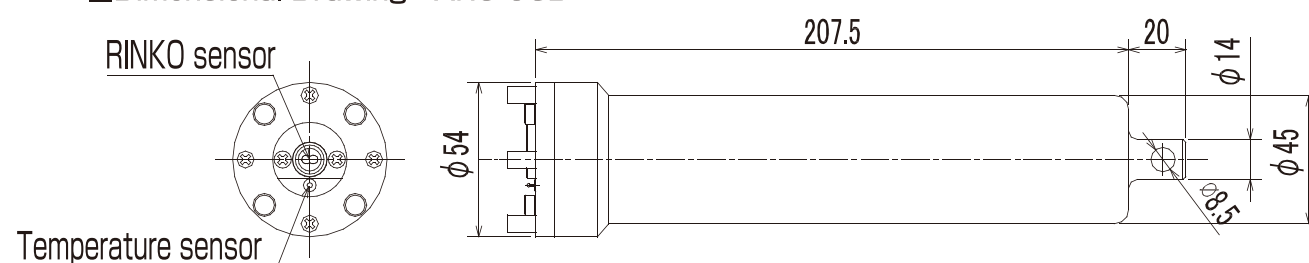
Overview

The RINKO I/ID is a DO meter of the miniSD card recording-type INFINITY data logger series. This DO meter allows you to set various measurement settings, enabling mooring observations as well as other simultaneous observations when installed to a sampling bottle, CTD, or the like that is currently in use. The fast responding DO sensor allows you to quickly observe a vertical protocol that to date has taken much time. The RINKO I/ID is available with a depth sensor as well, making independent profile observation also possible.

Sensor Specifications

	RINKO I		RINKO ID		
Model name	ARO-USB		ARO1-USB (0 to 100m specification)		
Measured item	DO	Temperature	DO	Temperature	Depth
Sensor type	Phosphorescent	Thermistor	Phosphorescent	Thermistor	Semiconductor
Measurement range	0 to 200%	−5 to 45℃	0 to 200%	−5 to 45℃	0 to 50m (ARO 05) 0 to 100m (ARO 1) 0 to 200m (ARO 2) 0 to 500m (ARO 5)
Resolution	0.01 to 0.04%	0.001℃	0.01 to 0.04%	0.001℃	1/50,000 of range
Accuracy	Linear ±2%FS	±0.02℃	Linear ±2%FS	±0.02℃	±0.3%FS
Memory type	miniSD card				
Memory capacity	1GB provided as standard				
A/D conversion	16-bit digital conversion				
Measurement mode	Continuous mode, Burst mode				
Measurement interval	0.1 to 600 seconds				
Burst time	1 to 1,440 minutes				
No. of samples	1 to 18,000				
Power source / capacity	CR-V3 lithium battery / 3.3 Ah				
	Two maximum		Four maximum		
Communication method	USB communication				
Current consumption	125mA		130mA		
Housing material	Ti-6Al-4V		Titanium (grade 2)		
Dimensions	φ54mm×245mm		φ70mm×232mm		
Weight	Approx. 0.9 kg in air, 0.6 kg in water		Approx. 1.2 kg in air, 0.6 kg in water		
Pressure resistance	7,000m depth equivalent		1,000m depth equivalent within maximum range of pressure sensor		

Dimensional Drawing ARO-USB



Wired DO Sensor

RINKO II / ID

DO Temperature Depth

NEW

Specifications

	RINKO II		RINKO ID		
Model name	ARO-CAR/CAD		ARO1-CAR/CAD (0 to 100m specification)		
Measured item	DO	Temperature	DO	Temperature	Depth
Sensor type	Phosphorescent	Thermistor	Phosphorescent	Thermistor	Semiconductor
Measurement range	0 to 200%	-5 to 45°C	0 to 200%	-5 to 45°C	0 to 50m (ARO 05) 0 to 100m (ARO 1) 0 to 200m (ARO 2) 0 to 500m (ARO 5)
Resolution	0.01 to 0.04%	0.001°C	0.01 to 0.04%	0.001°C	1/50,000 of range
Accuracy	Linear ±2%FS	±0.02°C	Linear ±2%FS	±0.02°C	±0.3%FS
Output	RS232C(Model name: CAR or CAD)				
Communication method	Handshake or stream				
Cable	20m, standard				
A/D conversion	16-bit digital conversion				
Power source	External 12V DC		External 12V DC		
Current consumption	35mA		35mA		
Housing material	Titanium (grade 2)		Titanium (grade 2)		
Dimensions	φ54mm×184mm		φ70mm×173mm		
Weight	Approx. 0.5 kg in air, 0.3 kg in water		Approx. 1.0 kg in air, 0.5 kg in water		
Pressure resistance	1,000m depth equivalent		1,000m depth equivalent within maximum range of pressure sensor		

Overview

RINKO II/ID is a digital output type dissolved oxygen sensor. The sensor employs an RS232C or RS485 communication method, making it easy to embed the sensor into other systems. The sensor can also be used as a direct-reading oxygen meter when provided with a PC and external power source (12V).



ARO-CAR

ARO1-CAR

RINKO III

DO Temperature

NEW

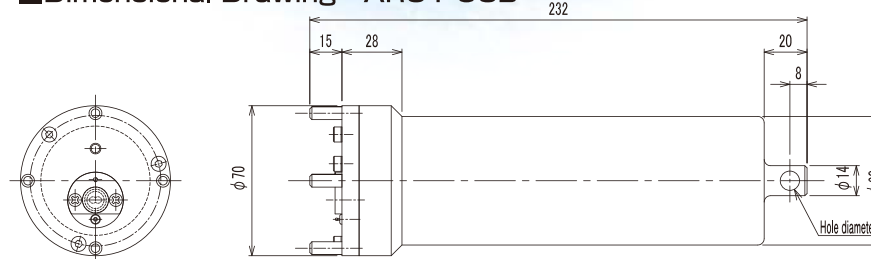
Overview

RINKO III is a model that was developed based on the concept of insertion into a deep-sea multiple sample bottle type CTD system. This model receives a 12V DC power supply and outputs DO and water temperature data using 0 to 5V analog signals, making it possible to use the device by connecting it to an external input CH of a CTD system. The high-speed response allows you to achieve continuous, highly accurate profile data without restricting sample system operation.



CTD connector

Dimensional Drawing ARO1-USB

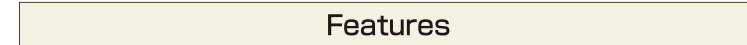


Specifications

	RINKO III	
Model name	ARO-CAV	
Measured item	DO	Temperature
Sensor type	Phosphorescent	Thermistor
Measurement range	0 to 200%	-5 to 45°C
Resolution	0.01 to 0.04%	0.001°C
Accuracy	Linear ±2%FS	±0.02°C
Output	Analog voltage (0 to 5V)	
Power source	12V DC	
Current consumption	35mA	
Housing material	Ti-6Al-4V	
Dimensions	φ54mm×252mm	
Weight	Approx. 0.8 kg in air, 0.5 kg in water	
Pressure resistance	7,000m depth equivalent	
Immersed connector	AG306-HP(Impulse Technologies, Inc.)	

NEW

ASTD102 Depth Temperature Salinity DO Chlorophyll Turbidity



- ① Provided with fast-responding DO sensor as standard
 - Significantly short observation time
 - Acquisition of more detailed DO vertical distributions
- ② Equipped with high-capacity built-in memory, eliminating the need for cables
- ③ Provided with built-in rechargeable lithium-ion batteries
- ④ Reduces water leakage and instability with immersion-type connector (patented)
- ⑤ Enables vertical observations at a minimum 10cm pitch (depth trigger mode)
- ⑥ Enables observations over time in a short period (time trigger mode)
- ⑦ Reduces corrosion instability with its titanium body
- ⑧ Features a miniature, light weight design of approx. 2.0kg in air and 1.0kg in water

The RINKO-Profiler is a DO profiler that is equipped with a fast-responding DO sensor in a CTD, as standard. With its extremely fast response time in water of 0.4 seconds, the RINKO-Profiler significantly reduces the observation time required to date, and makes it possible to achieve more detailed DO vertical distribution measurements. The device features an extremely light weight of about 0.1 kg in water, as well as a built-in recording design, eliminating the need for a dedicated cable. This new design allows you to take water temperature, salinity, and DO vertical profile measurements with ease at any depth pitch by simply dropping the device into the water using a rope or the like. (The ASTD 152 model also allows you to measure chlorophyll and turbidity as well.)

With a 1 GB high-capacity internal memory, profile data of up to a water depth of 100m at a 0.1m pitch can be recorded approximately 1,000 times. Each set of profile data is then filed internally and managed using calendar clock information inside the main body. The internal battery that serves as the power source is a rechargeable lithium battery, allowing continual use for 10 hours with a three-hour charge time. The communication connector employed is an immersion-type connector, which eliminates the need for opening the main body and enables communication with the interface and PC as well as charging using a dedicated cable. The device is provided with two types of interfaces: a PC communication model and a model that comes with a printer, enabling on-the-spot data verification.



Measurement scene

Measured item	Depth	Temperature	Conductivity	Salinity	DO	Chlorophyll	Turbidity
Sensor type	Semiconductor pressure sensor	Thermistor	Electrode	Practical salinity	Phosphorescent	Fluorimeter	Backscattering
Measurement range	0 to 600m	-5 to 40°C	0 to 70mS/cm	0 to 40	0 to 20mg/l (0 to 200%)	0 to 400ppb (Uranine reference)	0 to 1,000FTU (Formazin reference)
Resolution	0.01m	0.001°C	0.001mS/cm	0.001	0.001mg/l(0.01%)	0.01ppb	0.03FTU
Accuracy	±0.3%FS	±0.01°C (0 to 35°C)	±0.01mS/cm (2 to 65mS/cm)	±0.01	±2%FS (±2%FS)	±1%FS Zero drift ±0.1ppb	±0.3 FTU or measured value ±2%
Time constant	0.2 seconds	0.2 seconds	0.2 seconds	0.2 seconds	0.4 seconds	0.2 seconds	0.2 seconds

*Also available with a depth range of 1,000m.

Measurement mode	Depth trigger mode	Time trigger mode
Measurement interval	0.1/0.2/0.5/1 m	0.1 to 600 seconds
Memory type	1 GB built-in memory	
Recording capacity	100m at 0,1m-pitch, approx. 1,000 times	Data: Approx. 8,000,000
Power source	Rechargeable lithium ion battery (approx. 10 hours of continual use possible)	
Housing material	Titanium (grade 2)	
Dimensions	ø 136mm×491 mm	
Weight	Approx. 0.2kg in air, 1.0kg in water	
Pressure resistance	1,000m depth equivalent	



Power source	100V to 240V AC or AA alkaline battery x 4 (approx. 40 hours)
Dimensions	ø 136mm x 491mm
Weight	Approx. 1.0kg

Printed items	Depth, temperature, salinity, DO, chlorophyll, turbidity
Printer specifications	Thermal paper type (approx. 9,000 lines/roll)
Functions	Data printing, observation setting, data communication, sensor charging
Power source	Built-in rechargeable battery (100V AC charge)
Dimensions	330mm×200mm×220mm
Weight	Approx. 3.8kg
Waterproof characteristics	Simple splash-proof structure

Technical drawing of the front view of the sensor assembly. The drawing shows a cylindrical sensor with a diameter of 138 mm. The total length is 491 mm. The sensor is divided into three main sections: a front section with a diameter of 74 mm and a length of 141 mm, a middle section with a diameter of 60 mm and a length of 108 mm, and a rear section with a diameter of 28 mm and a length of 14 mm. The front section is labeled "Sensor guard (acetal resin)" and the middle section is labeled "Pressure-resistant housing (titanium, grade 2)". The rear section features an "Output, charging terminal" with a 12-degree chamfer. The drawing also shows a 12 mm diameter hole in the front section and a 12 mm diameter hole in the rear section.

Direct-reading comprehensive water quality meter

AAQ-RINKO

Depth Temperature Conductivity Fresh Water EC Salinity Chlorophyll Turbidity DO pH Quantum ORP

NEW

Overview

Our comprehensive water quality sensor series AAQ1183 has been redesigned as AAQ-RINKO, an optical DO sensor (RINKO) series featuring a fast response time of 0.4 seconds (in water). While DO measurement to date had required the sensor to be kept in water for a certain period of time at the measurement depth due to the slow sensor response time, AAQ-RINKO makes vertical measurement possible at a drop speed of 0.5m/seconds, similar to CTD observation, thereby significantly shortening the work time and enabling acquisition of more detailed vertical distributions of dissolved oxygen. While the measured items include the seven items measured to date, i.e., water temperature, depth, salinity, chlorophyll, turbidity, DO and pH, the meter also enables simultaneous installation of quantum and ORP sensors as well. The processing unit is available in four types in accordance with the observation application.

Specifications

Measured item	Type	Measurement Range	Resolution	Accuracy	Time Constant
Depth	Semiconductor pressure sensor	0 to 50m	0.001m	±0.3%FS	0.2 seconds
Temperature	Thermistor	-5 to 40°C	0.001°C	±0.01°C (0 to 35°C)	0.2 seconds
Conductivity	Electrode type	0 to 70mS/cm	0.001mS/cm	±0.01mS/cm (2 to 65mS/cm)	0.2 seconds
Fresh-water EC	Electromagnetic induction cell	0 to 500µS/cm	0.1µS/cm	±20µS/cm	0.2 seconds
Salinity	Practical salinity type	0 to 40	0.001	±0.01	0.2 seconds
Turbidity	Backscattering type	0 to 1,000FTU (Formazin reference)	0.03FTU	±2%	0.2 seconds
Chlorophyll	Fluorimeter	0 to 440 ppb (Uranin reference)	0.01ppb	±1%	0.2 seconds
Do	Phosphorescent type	0 to 20 mg/l (0 to 200%)	0.001mg/l (0.01%)	±0.4mg/l(±2%)	0.4 seconds
Quantum	Photodiode	0 to 5,000 µmol/(s·m²)	0.1 µmol/(s·m²)	±5%	0.2 seconds
pH	Glass electrode	2 to 14pH	0.01pH	±0.2	10 seconds
ORP	Electrode	0 to ± 1,000mV	0.1mV	—	10 seconds

*Also available with a depth range of 100m.

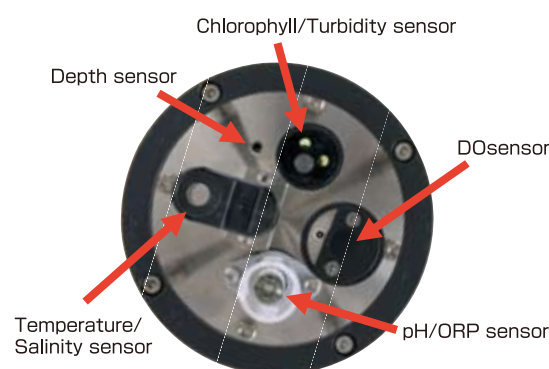
Model and Observation Items

	Depth	Temperature	Conductivity	Fresh Water EC	Salinity	Chlorophyll	Turbidity	DO	pH	Quantum	ORP
AAQ120	●	●	●	●	●	●	●	●	●	●	●
AAQ121	●	●	●	●	●	●	●	●	●	●	●
AAQ122	●	●	●	●	●	●	●	●	●	●	●
AAQ125	●	●	●	●	●	●	●	●	●	●	●
AAQ126	●	●	●	●	●	●	●	●	●	●	●
AAQ127	●	●	●	●	●	●	●	●	●	●	●

*The model names are those for a depth range of 0 to 50m.

Probe Specifications

Communication method	RS-485
A/D conversion	16-bit digital conversion
Dimensions	φ88.5mm×293mm
Weight	Approx. 2.4kg in air, 1.1kg in water
Housing material	Titanium (grade 2)



Printer Unit

This model was designed with the objective of use in full-scale ocean surveys. All operations are performed using the touch panel and external pushbuttons. The colored liquid crystal makes the screen easy to view at nighttime as well. This model is a multi-functional model, featuring functions such as vertical graph drawing, data printing, and recording. A GPS is provided as standard, making it possible to simultaneously record position information as well.

Hand-Held Unit

This hand-held unit superior in portability allows you to display data as well as record data in the memory of the main unit. The model has a built-in battery, and allows you to record your observations by performing simple button operations. The unit is also provided with interface module functions as well.

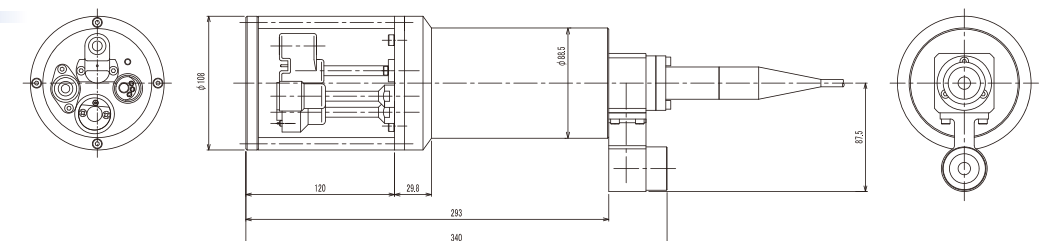
Interface Module

This interface module connects to your PC, allowing you to perform monitoring and collect data in real-time. Two types of units are available: a splash-proof type and an easy type. The secondary processing program (option) allows you to simply edit data (delete erroneous values, calculate averages, and extract data), perform SS analysis, and convert data to chlorophyll analytical values.

Sensor Specifications

	Printer Unit (PC-11)	Hand-Held Unit (H-11)	Splash-Proof Interface	Easy Interface
Screen	Color 7-inch TFT liquid crystal	4×20-line LCD	3 LEDs	None
Operation method	Screen touch panel External pushbuttons	Touch buttons	None	None
Displayed information	GPS information, measurement data, vertical graph	Measurement data	Voltage level	None
Memory type	512MB compact flash memory	512MB compact flash memory	None	None
Measurement method	1. Automatic vertical measurement by selected depth pitch (selectable values: 0.1, 0.2, 0.5, 1m). 2. Records measurement data at any depth on-the-spot	Continuous measurement at each selected interval (0.1, 0.2, 0.5, 1, 2, 5, 10 seconds)	Measurement at selected interval based on PC side application software	Measurement at selected interval based on PC side application software
Print function	1. Automatic onsite printing of measured data after automatic vertical measurement 2. Onsite printing of measured data at the time of spot measurement	None (data printing achieved by external printer connection)	None	None
Calendar information	Built-in (automatic correction by GPS)	Built-in	None	None
Power source	100V AC and 12V DC	8 AA alkaline batteries, 100V AC, 12V DC	8 AA alkaline batteries, 12V DC	100V AC, 12V DC
Dimensions	470mm×357mm×176mm	85mm×115mm×255mm	199mm×83mm×45.6mm	55mm×115mm×90mm
Weight	Approx. 7.9kg	Approx. 1.0kg (not including batteries)	Approx. 0.5kg	Approx. 0.1kg
Other functions	Built-in GPS as standard, data extractable using USB memory	—	—	—

Dimensional Drawing



INFINITY series

Unlimited potential in oceanographic observation

The INFINITY series offers new generation built-in recording type measuring instruments controlled by a high-performance 16-bit MCU and provided with a miniSD card.

The INFINITY series allows you to set observations settings by direct input from a PC via a USB or by PC input using a miniSD card removed from the measuring device. Use of the USB or miniSD card enables high-speed communication.

As a result, prompt, safe, and easy management is possible regardless of the onsite environment.

Feature

INFINITY series features

- Utilizes high-speed USB communication
- Utilizes a high-capacity miniSD card
- Utilizes commercial batteries
- Emits beeps for operation verification
- Employs common software, making the device easy to use

Large memory capacity

The INFINITY series is provided with a miniSD card having a 1GB memory capacity as standard, but guarantees operation with a commercial miniSD card of up to 2GB, allowing you to replace the card in accordance with observation specifications. The standard 1GB card enables recording of a 16-million data volume, maximum.



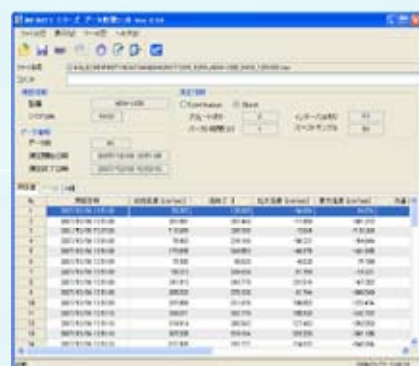
Battery

The INFINITY series employs a camera lithium battery (CR-V3). This battery can be easily found at camera shops and stores that sell household electronic goods. A maximum of four batteries can be inserted in the device, but operation is possible with only one, allowing economical use in accordance with observation specifications.

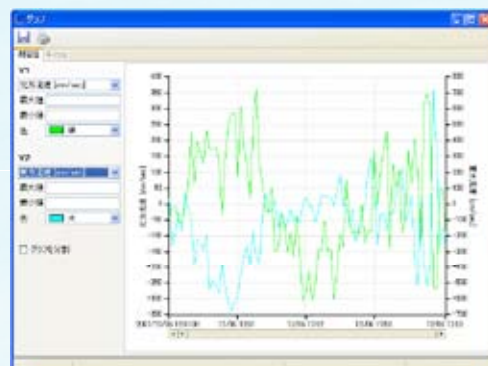


Common software

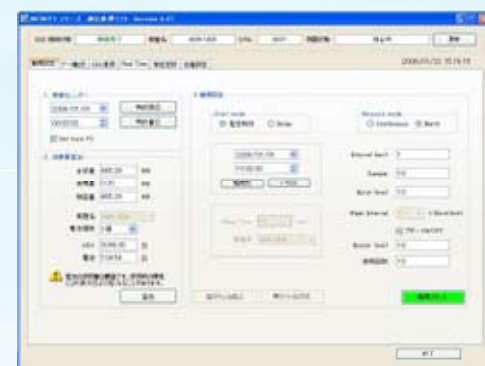
The communication software and processing software of the INFINITY series are common to all equipment. The design emphasizes easy operability. Files recorded in the miniSD card are ASCII files, enabling as-is processing using commercial spreadsheet software.



Data display screen



Time-series graph screen



Communication screen

Miniature logger-type current meter

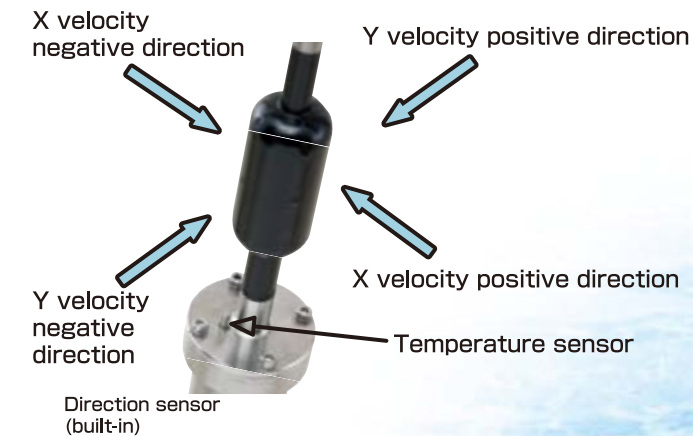
INFINITY-EM

AEM-USB

Velo
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Direc
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Tempe
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Overview

The INFINITY-EM is a compact, light-weight electromagnetic current. The velocity sensor utilized is a time-proven electromagnetic velocity sensor, enabling accurate velocity measurement for all currents, from weak to strong.



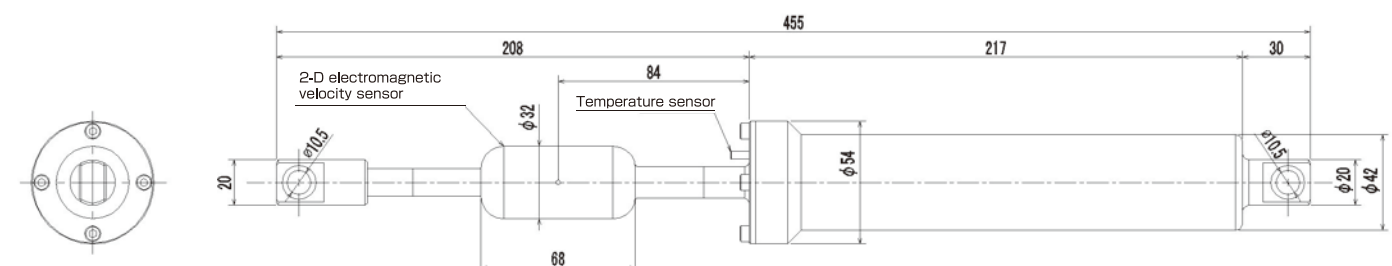
Sensor Specifications

Measured item	Velocity	Direction	Temperature
Sensor type	2-D electromagnetic velocity sensor	Hole element	Thermistor
Measurement range	0 to $\pm 500\text{cm/s}$	0 to $\pm 360^\circ$	-5 to 45°C
Resolution	0.02cm/s	0.01°	0.001°C
Accuracy	$\pm 1\text{cm/s}$ or $\pm 2\%$	$\pm 2^\circ$	$\pm 0.02^\circ\text{C}$

Logger Specifications

Memory type	miniSD card (16MB to 2GB)
Memory capacity	1GB provided as standard (miniSD card)
A/D conversion	16-bit digital conversion
Measurement mode	Continuous mode, Burst mode
Measurement interval	0.1 to 600 seconds
Burst time	1 to 1,440 minutes
No. of samples	1 to 18,000
Power source / capacity	CR-V3 lithium battery / 3.3Ah (two maximum)
Communication method	USB communication (Ver. 2.0 compliant, Ver. 1.1 equivalent)
Current consumption	90mA
Housing material	Titanium (grade 2)
Dimensions	$\phi 42\text{mm}$ (Flange area: $\phi 54\text{mm}$) $\times 455\text{mm}$
Weight	Approx. 1.0kg in air, 0.6kg in water
Pressure resistance	1,000m depth equivalent
Tensile strength	Approx. 2kN (200kg equivalent)

Dimensional Drawing



Deep-sea logger-type velocity meter

INFINITY-Deep EM Velo city Direc tion Slope Depth Tempe rature
AEM233-USB



■Overview

With the extremely slow velocity and small amount of suspended particles in deep-sea regions, the light reflection intensity is inadequate, causing difficulties in measurement, even with an ultrasonic velocity meter. Our deep-sea INFINITY-Deep meter boasts a pressure-resistance of 6,000m, making it possible to take deep-sea measurements. This meter was evolved from standard INFINITY-EM specifications, offering identification of a mooring conditions and velocity correction with its depth sensor and slope sensor. The double power supply capacity makes long-term mooring observation possible.

■Sensor Specifications

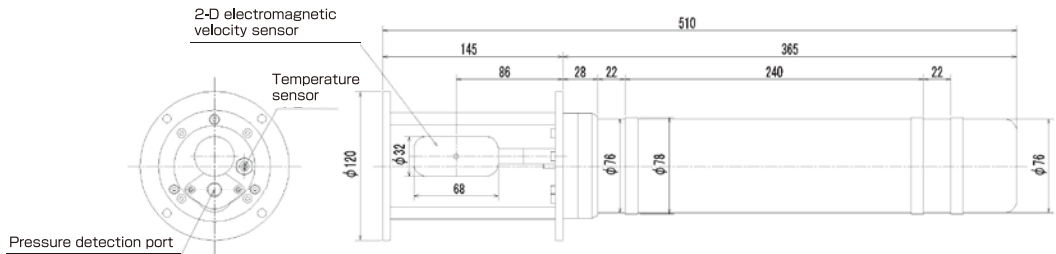
Measured item	Velocity	Direction	Temperature	Depth	Slope
Sensor type	2-D electromagnetic velocity sensor	Hole element	Thermistor	Semiconductor sensor	2-D type
Measurement range	0 to ± 100cm/s	0 to ± 360°	-5 to 45°C	0 to 6,000m	0 to ±30°
Resolution	0.02cm/s	0.01°	0.001°C	0.1m	0.01°
Accuracy	±1cm/s or ±2%	±2°	±0.02°C	±0.3%FS	±1°

■Logger Specifications

Memory type	miniSD card (16MB to 2GB)
Memory capacity	1GB provided as standard (miniSD card)
A/D conversion	16-bit digital conversion
Measurement mode	Continuous mode, Burst mode
Measurement interval	0.1 to 600 seconds
Burst time	1 to 1,440 minutes
No. of samples	1 to 18,000
Power source / capacity	CR-V3 lithium battery / 3.3Ah (four maximum)
Communication method	USB communication (Ver. 2.0 compliant, Ver. 1.1 equivalent)
Current consumption	110mA
Housing material	Ti-6Al-4V
Dimensions	φ120mm×510mm
Weight	Approx. 4.4kg in air, 2.3kg in water
Pressure resistance	6,000m depth equivalent

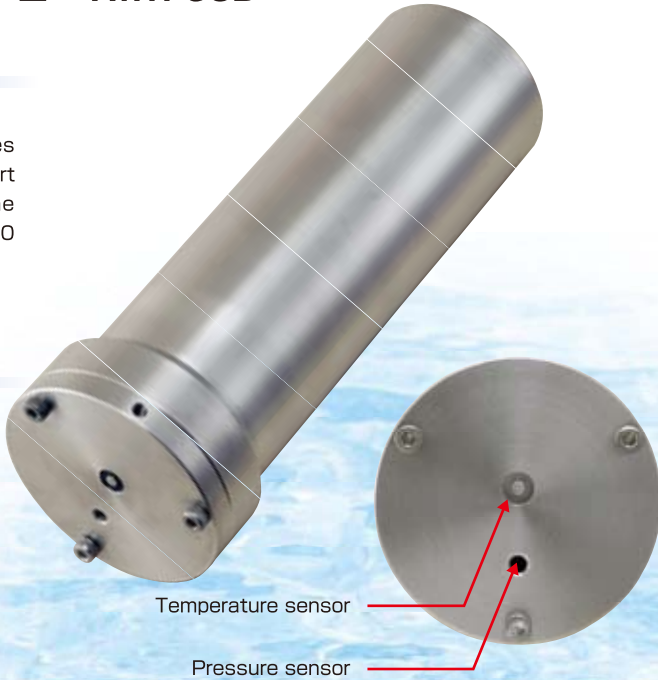
*Under development. Specifications are subject to change without notice.

■Dimensional Drawing



Water-pressure logger-type wave height meter

INFINITY-WH Wave Height Tide Level Tempe rature
AWH-USB



■Overview

The INFINITY-WH is provided with a high capacity storage medium that enables 0.1-second sampling, allowing you to observe a variety of wave heights, from short to long period waves. With 20-minute measurements per one-hour burst, the instrument makes one-month long continual observation possible (with 12,000 samples).

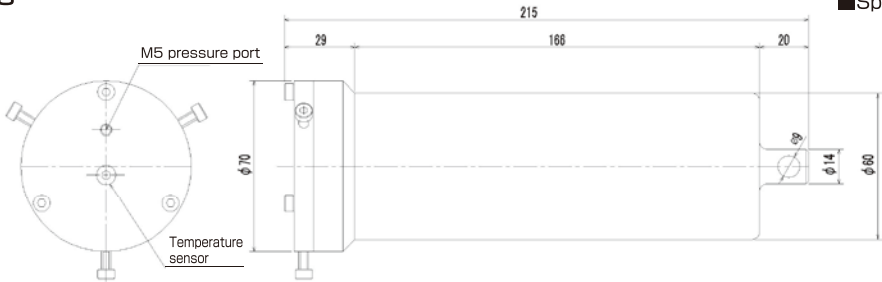
■Sensor Specifications

Measured item	Pressure (depth)	Temperature (option)
Sensor type	Semiconductor	Thermistor
Measurement range	0 to 25m	-5 to 45°C
Resolution	0.0005m	0.001°C
Accuracy	±0.1%FS	±0.02°C

■Logger Specifications

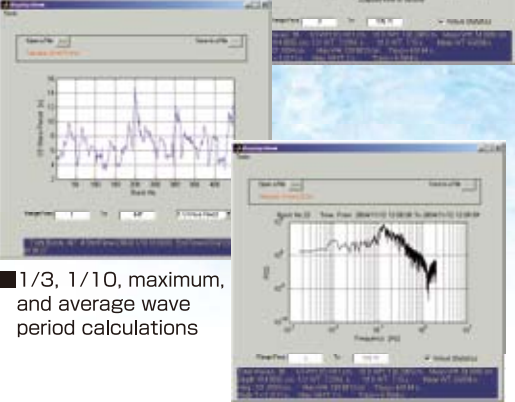
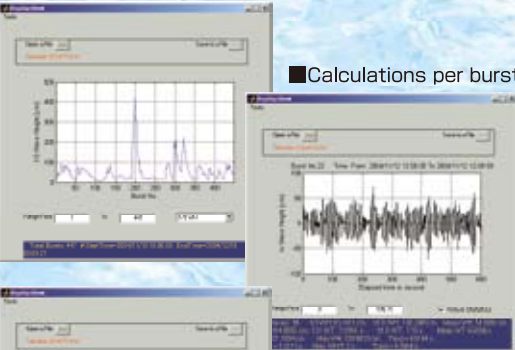
Memory type	miniSD card (16MB to 2GB)
Memory capacity	1GB provided as standard (miniSD card)
A/D conversion	16-bit digital conversion
Measurement mode	Continuous mode, Burst mode
Measurement interval	0.1 to 600 seconds
Burst time	1 to 1,440 minutes
No. of samples	1 to 18,000
Power source / capacity	CR-V3 lithium battery / 3.3Ah (four maximum)
Communication method	USB communication (Ver. 2.0 compliant, Ver. 1.1 equivalent)
Current consumption	30mA
Housing material	Titanium (grade 2)
Dimensions	φ70mm×215mm
Weight	Approx. 1.2kg in air, 0.6kg in water
Pressure resistance	25m depth equivalent

■Dimensional Drawing



■Wave Analysis Software (Option)

■1/3, 1/10, maximum, and average wave height calculations



■1/3, 1/10, maximum, and average wave period calculations

■Spectrum calculations

Deep-sea logger-type velocity meter

INFINITY-Deep EM Velo city Direc tion Slope Depth Tempe rature
AEM233-USB



■Overview

With the extremely slow velocity and small amount of suspended particles in deep-sea regions, the light reflection intensity is inadequate, causing difficulties in measurement, even with an ultrasonic velocity meter. Our deep-sea INFINITY-Deep meter boasts a pressure-resistance of 6,000m, making it possible to take deep-sea measurements. This meter was evolved from standard INFINITY-EM specifications, offering identification of a mooring conditions and velocity correction with its depth sensor and slope sensor. The double power supply capacity makes long-term mooring observation possible.

■Sensor Specifications

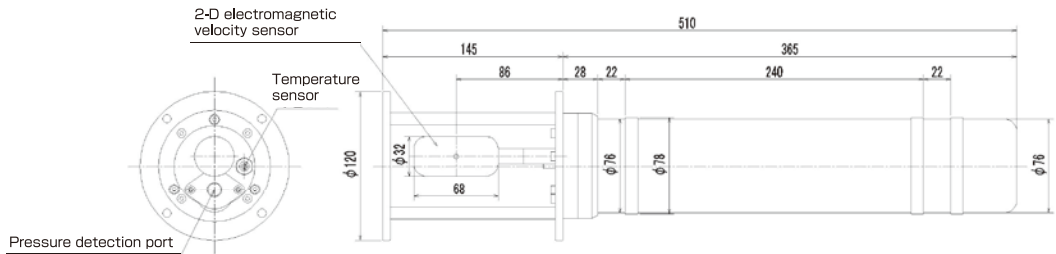
Measured item	Velocity	Direction	Temperature	Depth	Slope
Sensor type	2-D electromagnetic velocity sensor	Hole element	Thermistor	Semiconductor sensor	2-D type
Measurement range	0 to ± 100cm/s	0 to ± 360°	-5 to 45°C	0 to 6,000m	0 to ±30°
Resolution	0.02cm/s	0.01°	0.001°C	0.1m	0.01°
Accuracy	±1cm/s or ±2%	±2°	±0.02°C	±0.3%FS	±1°

■Logger Specifications

Memory type	miniSD card (16MB to 2GB)
Memory capacity	1GB provided as standard (miniSD card)
A/D conversion	16-bit digital conversion
Measurement mode	Continuous mode, Burst mode
Measurement interval	0.1 to 600 seconds
Burst time	1 to 1,440 minutes
No. of samples	1 to 18,000
Power source / capacity	CR-V3 lithium battery / 3.3Ah (four maximum)
Communication method	USB communication (Ver. 2.0 compliant, Ver. 1.1 equivalent)
Current consumption	110mA
Housing material	Ti-6Al-4V
Dimensions	φ120mm×510mm
Weight	Approx. 4.4kg in air, 2.3kg in water
Pressure resistance	6,000m depth equivalent

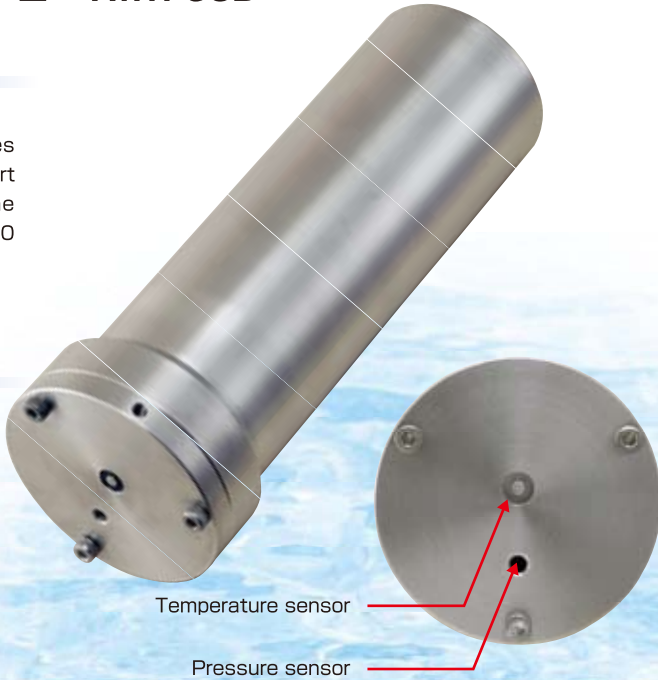
*Under development. Specifications are subject to change without notice.

■Dimensional Drawing



Water-pressure logger-type wave height meter

INFINITY-WH Wave Height Tide Level Tempe rature
AWH-USB



■Overview

The INFINITY-WH is provided with a high capacity storage medium that enables 0.1-second sampling, allowing you to observe a variety of wave heights, from short to long period waves. With 20-minute measurements per one-hour burst, the instrument makes one-month long continual observation possible (with 12,000 samples).

■Sensor Specifications

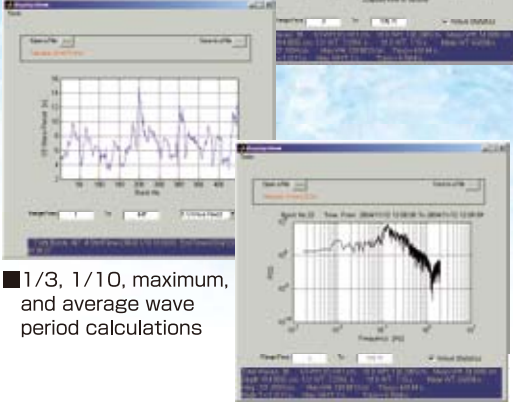
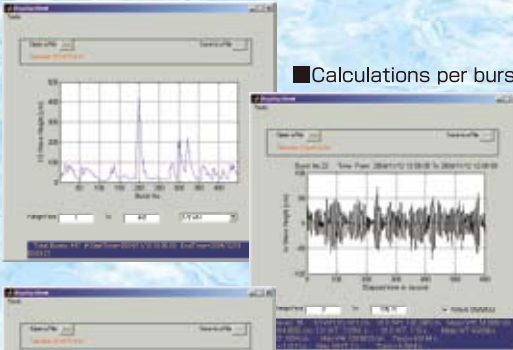
Measured item	Pressure (depth)	Temperature (option)
Sensor type	Semiconductor	Thermistor
Measurement range	0 to 25m	-5 to 45°C
Resolution	0.0005m	0.001°C
Accuracy	±0.1%FS	±0.02°C

■Logger Specifications

Memory type	miniSD card (16MB to 2GB)
Memory capacity	1GB provided as standard (miniSD card)
A/D conversion	16-bit digital conversion
Measurement mode	Continuous mode, Burst mode
Measurement interval	0.1 to 600 seconds
Burst time	1 to 1,440 minutes
No. of samples	1 to 18,000
Power source / capacity	CR-V3 lithium battery / 3.3Ah (four maximum)
Communication method	USB communication (Ver. 2.0 compliant, Ver. 1.1 equivalent)
Current consumption	30mA
Housing material	Titanium (grade 2)
Dimensions	φ70mm×215mm
Weight	Approx. 1.2kg in air, 0.6kg in water
Pressure resistance	25m depth equivalent

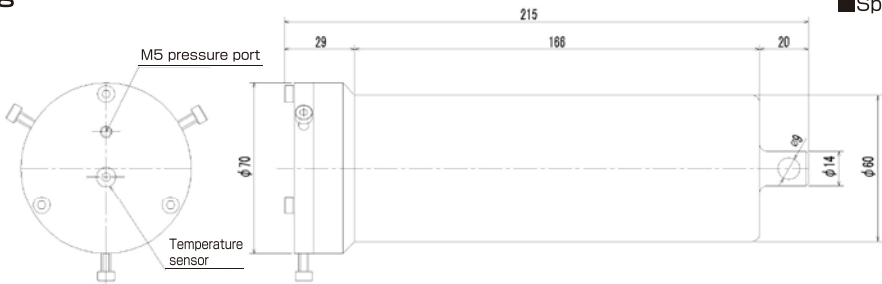
■Wave Analysis Software (Option)

■1/3, 1/10, maximum, and average wave height calculations



■Spectrum calculations

■Dimensional Drawing



Miniature logger-type temperature and salinity meter

INFINITY-CT

A7CT-USB



Overview

This highly accurate temperature and salinity meter utilizes seven in-vitro electrodes inside the conductivity sensor. The meter boasts a 2,000m pressure resistance, and can be used for mooring observation at high depth.

Sensor Specifications

Measured item	Temperature	Electric conductivity
Sensor type	Thermistor	7-electrode type
Measurement range	-5 to 45°C	0 to 70mS/cm
Resolution	0.001°C	0.001mS/cm
Accuracy	±0.01°C(0 to 35°C)	±0.01mS/cm(2 to 65mS/cm)

Logger Specifications

Memory type	miniSD card (16MB to 2GB)
Memory capacity	1GB provided as standard (miniSD card)
A/D conversion	16-bit digital conversion
Measurement mode	Continuous mode, Burst mode
Measurement interval	0.1 to 600 seconds
Burst time	1 to 1,440 minutes
No. of samples	1 to 18,000
Power source / capacity	CR-V3 lithium battery / 3.3Ah (two maximum)
Communication method	USB communication (Ver. 2.0 compliant, Ver. 1.1 equivalent)
Current consumption	90mA
Housing material	Titanium (grade 2)
Dimensions	φ54mm×255mm(including sensor card)
Weight	Approx. 0.7kg in air, 0.3kg in water
Pressure resistance	2,000m depth equivalent

Logger-type temperature and salinity meter with wiper

INFINITY-CTW

ACTW-USB



Overview

In general, salinity sensors are readily affected by fouling, such as the adherence of living organisms. Long-term continual observation to date required maintenance every one to two weeks, necessitating labor. Our INFINITY-CTW salinity sensor, however, utilizes an in-vitro electrode sensor. Owing to the in-vitro design, the measured value of this sensor is not at all affected by external fouling, and is provided with a piston-type wiper that automatically sweeps the tube interior after each measurement, enabling acquisition of stable data even when maintenance has not been performed for two to three months.

Sensor Specifications

Measured item	Temperature	Electric conductivity
Sensor type	Thermistor	7-electrode type
Measurement range	-5 to 45°C	0 to 70mS/cm
Resolution	0.001°C	0.001mS/cm
Accuracy	±0.01°C(0 to 35°C)	±0.01mS/cm(2 to 65mS/cm)

Logger Specifications

Memory type	miniSD card (16MB to 2GB)
Memory capacity	1GB provided as standard (miniSD card)
A/D conversion	16-bit digital conversion
Measurement mode	Continuous mode, Burst mode
Measurement interval	0.1 to 600 seconds
Burst time	1 to 1,440 minutes
No. of samples	1 to 18,000
Power source / capacity	CR-V3 lithium battery / 3.3Ah (four maximum)
Communication method	USB communication (Ver. 2.0 compliant, Ver. 1.1 equivalent)
Current consumption	110mA
Housing material	Titanium (grade 2)
Dimensions	φ70mm×342mm(including sensor card)
Weight	Approx. 1.5kg in air, 0.6kg in water
Pressure resistance	500m depth equivalent

Observation Example

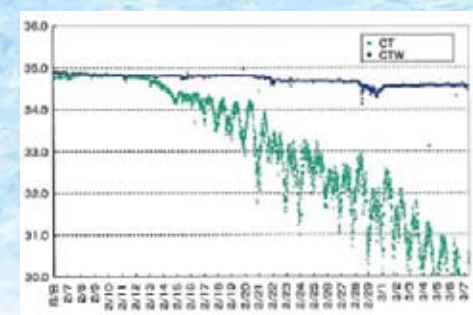
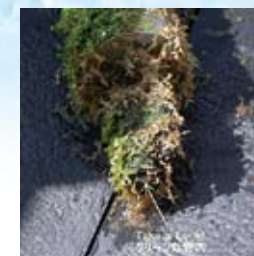
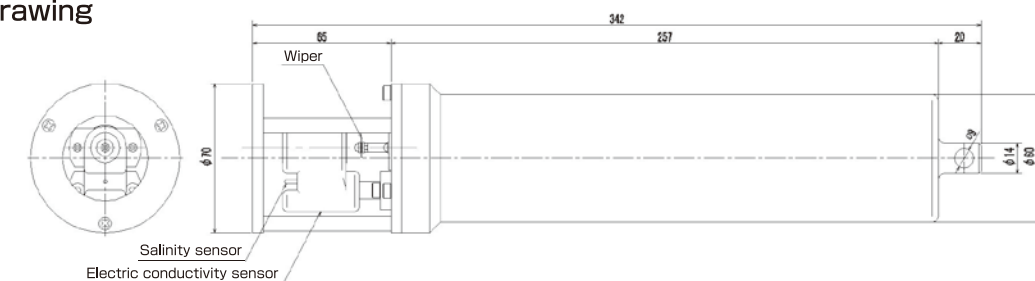


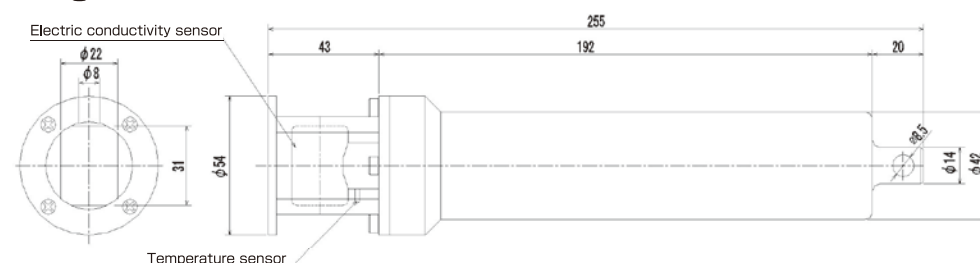
Image after sampling



Dimensional Drawing



Dimensional Drawing



Logger-type chlorophyll and turbidity meter with wiper

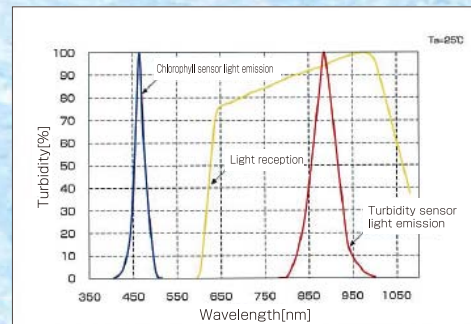
INFINITY-CLW

ACLW-USB

Chloro
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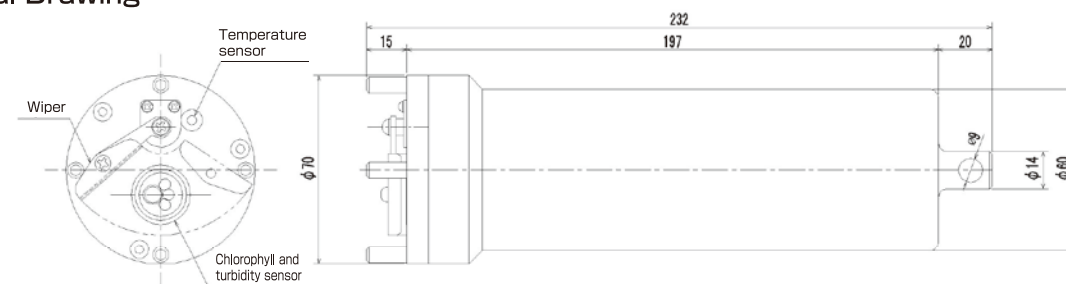
Spectral Sensitivity Characteristics



Example of Wiper Effect



Dimensional Drawing



Miniature logger-type turbidity meter

INFINITY-Turbi

ATU75W-USB

Turbi
dity Depth Tempe
rature

Overview

The INFINITY-Turbi is a logger-type turbidity meter equipped with two turbidity sensors for medium-level and high-level density measurements, enabling high-precision measurement across a wide range, from normal to high turbidity periods.

This instrument is provided with temperature and depth sensors as standard as well, accommodating a variety of measurement needs. The optical sensor area is also equipped with a wiper for removing fouling, making long-term continual observation possible.

Sensor Specifications

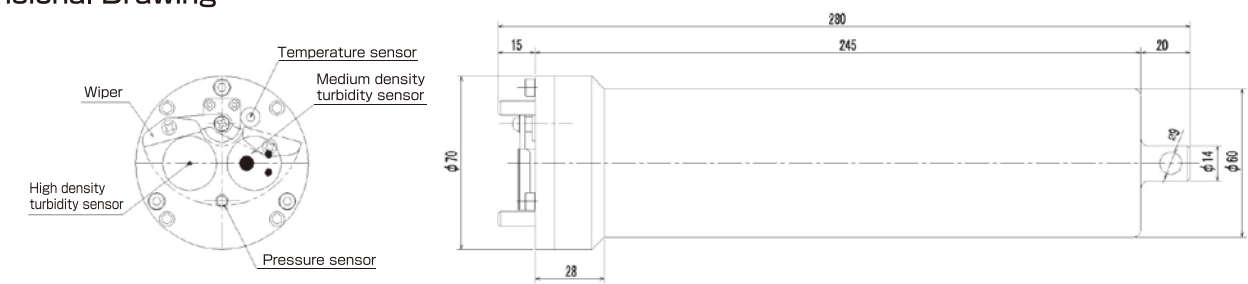
Measured item	Medium density turbidity	High density turbidity	Depth	Temperature
Sensor type	Infrared backscattering (LED)	Backscattering (optical fiber)	Semiconductor sensor	Thermistor
Measurement range	0 to 1,000FTU	0 to 100,000ppm	0 to 25m*	-5 to 45°C
Resolution	0.03FTU	2ppm	0.05cm	0.001°C
Accuracy	±0.3FTU or ±2%	±10ppm or ±5%	±3.5cm	±0.02°C

*Pressure range: Variable to 40m, 100m, and 200m.

Logger Specifications

Memory type	miniSD card (16MB to 2GB)
Memory capacity	1GB provided as standard (miniSD card)
A/D conversion	16-bit digital conversion
Measurement mode	Continuous mode, Burst mode
Measurement interval	0.1 to 600 seconds
Burst time	1 to 1,440 minutes
No. of samples	1 to 18,000
Power source / capacity	CR-V3 lithium battery / 3.3Ah (four maximum)
Communication method	USB communication (Ver. 2.0 compliant, Ver. 1.1 equivalent)
Current consumption	165mA
Housing material	Titanium (grade 2)
Dimensions	φ70mm×280mm
Weight	Approx. 1.4kg in air, 0.7kg in water
Pressure resistance	500m depth equivalent

Dimensional Drawing



Autonomous water sampling system

CTD with multiple water samplers

Depth Temperature Conductivity Chlorophyll Turbidity



Overview

This device is an autonomous water sampler based on Chlorotech CTD control, and serves as a compact CTD system with 10 sampling bottles. The device measures five items, including temperature, salinity (conductivity), depth, chlorophyll, and turbidity, comprises a rechargeable battery and built-in memory, and does not require a signal cable, making the CTD dedicated winch required to date no longer necessary and use on a small-sized boat possible with a winch of a capacity of approximately 150kg or greater. The sampling depth of each sampling bottle is set in advance by connecting the device to a PC on the ship. Once the CTD reaches the set depth, the lid automatically closes. Sampling in time series at a fixed point is also possible.

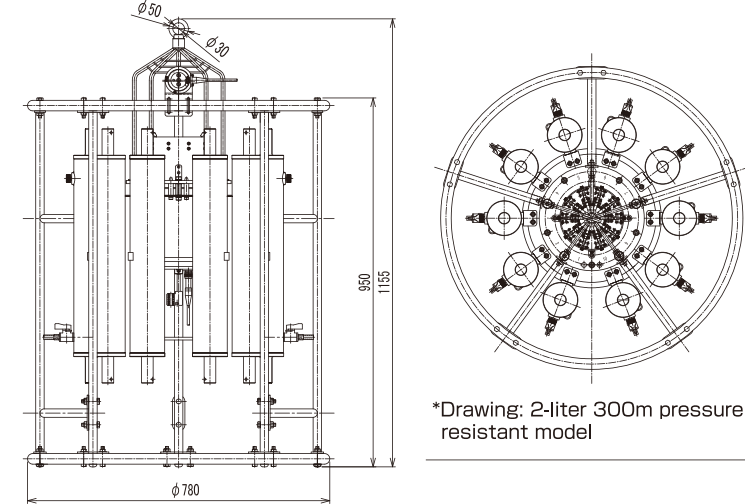
Sensor Specifications

Measured item	Type	Measurement range	Resolution	Accuracy
Depth	Semiconductor pressure sensor	0 to 300m/1,000m	0.01m/0.02m	0.3%FS
Temperature	Thermistor	-5 to 45°C	0.001°C	±0.01°C(0 to 35°C)
Salinity (conductivity)	Practical salinity type 7 in-vitro electrode type	0 to 40 0 to 60mS/cm	0.001 0.001mS/cm	±0.02 ±0.01mS/cm(2 to 65mS/cm)
Turbidity	Infrared backscattering	0 to 1,000FTU (Formazin reference)	0.03FTU	Measured value ±2% Zero drift ±0.3FTU
Chlorophyll	Fluorescence intensity	0 to 400µg/l (Uranine reference)	0.01µg/l	Linear ±1% Zero drift ±0.1µg/l

Memory Specifications

Measurement mode	Depth trigger	Time trigger
Measurement interval	0.1, 0.2, 0.5, 1m	0.1, 0.2, 0.5, 1 sec
Memory type	2MB flash memory	
Recording capacity	Approx. 77,786 data sets (300m at 0.1m pitch, 25 times)	Approx. 77,786 data sets
Measured items	Depth, temperature, salinity, chlorophyll, turbidity	
Recorded information	Date, depth, temperature, salinity, chlorophyll, turbidity, water sampling depth	

Dimensional Drawing



*Drawing: 2-liter 300m pressure resistant model

Sampling Bottle Specifications

Sampling method	Electronic-type electromagnetic solenoid method	
No. of sampling bottles	10	
Sampling bottle capacity	2 liters/bottle, 3 liters/bottle, 5 liters/bottle	
Simultaneous sampling	Simultaneous sampling of 3 bottles possible	
Sampling mode	Depth trigger mode 1m interval, minimum	Time trigger mode 1sec interval, minimum
Material	Sampling bottle material: PVC *Interior: Teflon coated Internal rubber: Silicon rubber tube Sampling control area: Stainless steel Protective housing: Stainless steel (partially titanium)	
Weight	Not during sampling: Approx. 56kg, During sampling: Approx. 76kg (two liter model) Not during sampling: Approx. 65kg, During sampling: Approx. 95kg (three liter model) Not during sampling: Approx. 73kg, During sampling: Approx. 128kg (five liter model)	
Power source	Rechargeable lithium ion battery Approx. 8 hours of observation possible when used continually	
Dimensions	H:1,155mm, φ780mm(two liter model) H:1,150mm, φ880mm(three liter model) H:1,150mm, φ930mm(five liter model)	
Pressure resistance	300m depth equivalent, 1,000m depth equivalent	

Sampling depth set in program



Sampling bottle easily inserted



Data processing program

Observation setting screen



Vertical graph display screen

The sampled layer is indicated by points.

Time series graph display screen

The sampled layer is indicated by points.

Data transfer screen

List display screen

The sampled layer is indicated by markers.

Multiwavelength excitation fluorescence photometer

Multi-Exciter

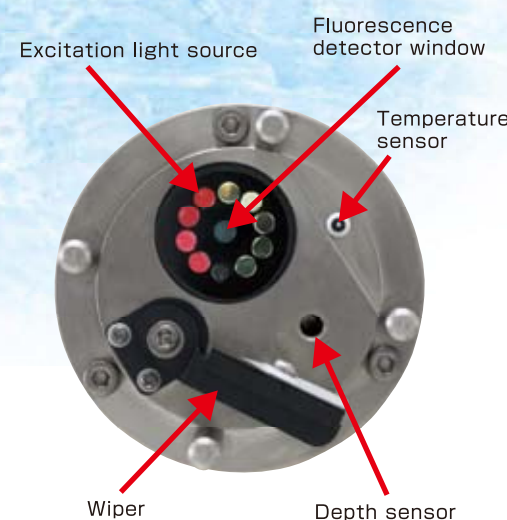
Chlorophyll Turbidity Depth Temperature



Real-time observation model

Measurement Principle

This device, unlike existing chlorophyll fluorescence photometers, excites phytoplankton using nine different wavelengths, measuring the resulting fluorescence characteristics (excitation fluorescence spectrum). Phytoplankton exhibit a particular pigment tissue and have different fluorescence characteristics in each community (group). As a result, the measured fluorescence characteristics contain species composition information. That information is mathematically processed by analytical software, enabling extraction of species composition (bacillariophyceae, dinophyceae, chlorophyceae, cyanophyceae, and cryptophyceae) information and speculation of the corresponding populations.



Sensor Specifications

Measured item	Fluorescence intensity	Turbidity	Temperature	Depth
Sensor type	Backscattering	Infrared backscattering	Thermistor	Semiconductor pressure sensor
Excitation light wavelength	375, 395, 420, 435, 470, 490, 535, 570, 590(nm)	880nm	—	—
Range	0 to 400ppb ₋₁	0 to 1,000FTU	−5 to 45°C	0 to 500m
Resolution	0.01ppb	0.03FTU	0.001°C	0.01m
Accuracy	±4%FS(0 to 200ppb)	±2%FS	±0.02°C ₋₂	0.3%FS

*1. Guaranteed temperature accuracy range: 3 to 31°C

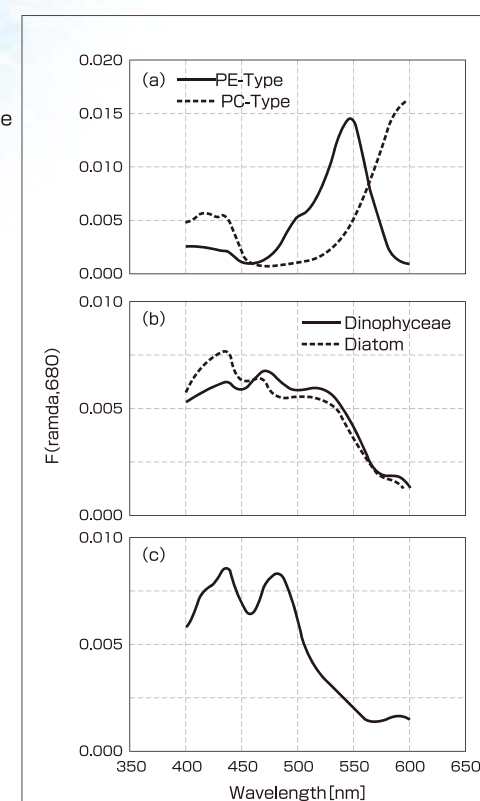
*2. 570nm of fluorescence output in 200ppb of rhodamine solution is for fluorescence intensity. Other wavelengths are standardized in accordance with the fluorescence characteristics of the rhodamine solution.

Features

- ① Multiwavelength excitation: 9 wavelengths
- ② Achieves highly sensitive fluorescence measurement, even in high turbidity environments
- ③ Automatically analyzes the species composition by software
- ④ Provided with a fluorescence characteristic library function for species composition analysis
- ⑤ Equipped with a wiper for preventing living organism adherence, as standard
- ⑥ Equipped with turbidity, temperature, and depth sensors

Chlorophyll fluorescence photometer capable of providing species composition information

The multiwavelength excitation fluorescence photometer measures the fluorescence characteristics of phytoplankton, allowing identification of not only the phytoplankton population but also the species (community) composition and corresponding population values. Our multiwavelength fluorescence photometer makes simultaneous measurement of population and species composition possible, something that has not been achievable by conventional chlorophyll fluorescence photometers to date.



Differences in the characteristics of excitation fluorescence according to pigment type (in brackets)
 (a) Cyanophyceae (phycobiliprotein)
 (b) bacillariophyceae, dinophyceae (carotenoid, Chl-c)
 (c) Chlorophyceae (Chl-b)

Greater Accuracy, Wider Application

With the nine wavelengths of excitation light, this instrument increases the wavelength resolution of fluorescence characteristics, significantly decreasing the impact of fouling (scattered light), which turns into fluorescence measurement noise, making it possible to speculate communities with greater accuracy. The instrument is equipped with a wiper function for preventing the adherence of living organisms, as standard, allowing you to perform long-term continual observation with confidence, even at shore regions where there is high living organism activity. The instrument is also equipped with turbidity, temperature, and depth sensors, accommodating a variety of observation applications with varying objectives in a single unit.

The models available include a wired digital output model suitable for real-time observation as well as incorporation in other platforms, and a data logger model (INFINITY specifications) that is equipped with memory for automatic measurement and recording, allowing use with a wide variety of observation specifications.

Logger Specifications (INFINITY Specifications)

Memory type	miniSD card (16MB to 2GB)
Memory capacity	1GB provided as standard
A/D conversion	16-bit digital conversion
Measurement mode	Continuous mode, Burst mode
Measurement interval	0.1 to 600 seconds
Burst time	1 to 1,440 minutes
No. of samples	1 to 18,000
Power source / capacity	CR-V3 lithium battery / 3.3Ah (four maximum)
Communication method	USB communication
Current consumption	420mA
Housing material	Titanium (grade 2)
Dimensions	φ70mm×296mm
Weight	Approx. 1.5kg in air, 0.8kg in water
Pressure resistance	500m depth equivalent



INFINITY-ME

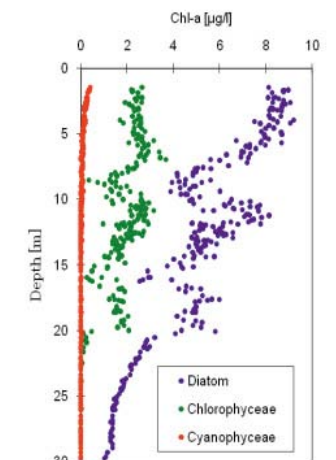
Data Recording Software



Measurement data screen
 Displays the excitation fluorescence spectrum and time-series chlorophyll fluorescence intensity.

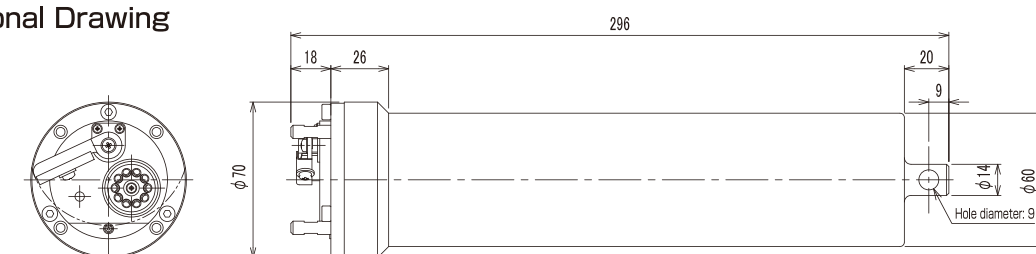


Species composition analysis screen
 Automatically speculates and displays the species composition from mathematical processing.

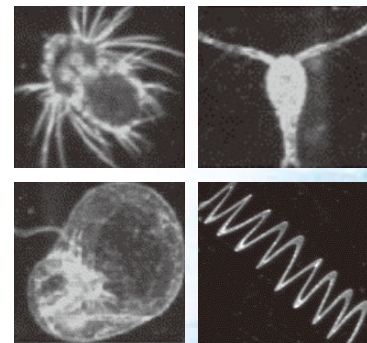


Vertical observation example

Dimensional Drawing



Particle-Counter



Main Specifications

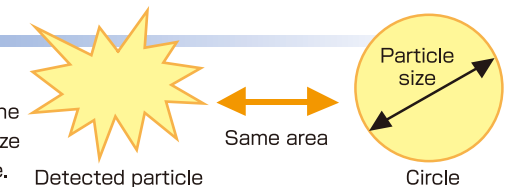
Instrument		
Model	IM-CA	
Photographable particle size	About 10 μ m to 500 μ m	
Image format	Bitmap	
	256 gray scale tones	
Maximum number of images taken	9,999	
Image taking speed (recording only)	10 images/second	
Particle size analysis speed	Approx. 5 particles/second	
Camera	CCD size	1/3"
	Resolution	1,034 $\times$ 779dpi
	Pixel size	4.65 $\times$ 4.65 μ m
Optical system	Optical magnification	Approx. 2.2 $\times$ (fixed magnification)
	Viewing range	2.1 $\times$ 1.6mm
	Subject depth of field	1.0mm
Communication	100Base/T, RS485	

Instrument		
Light source	Xenon flash lamp	
Cable	Outer diameter	ϕ 10.3mm
	Maximum length	50m
	Weight	5.75kg/50m
	Cross-sectional strength	100kgf
Pressure resistance	100m depth equivalent	
Dimensions	ϕ 105 $\times$ 494mm	
Weight	Approx. 6.1kg in air, 2.4kg in water	

Interface	
Form	IM-IF
Housing	Waterproof plastic box
Connector	Instrument, LAN, USB, power source
Power source	100 to 240V AC
Power consumption	50W or less (not including PC)
Weight	Approx. 1.5kg

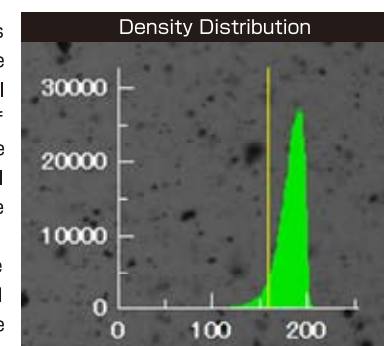
Analysis

The instrument detects the particles in the images that satisfy set conditions and calculates the particle surface area, size, major axis, and minor axis. The instrument assumes a circle of the same size as the surface area of the detected particle, and defines the diameter of that circle as the particle size.

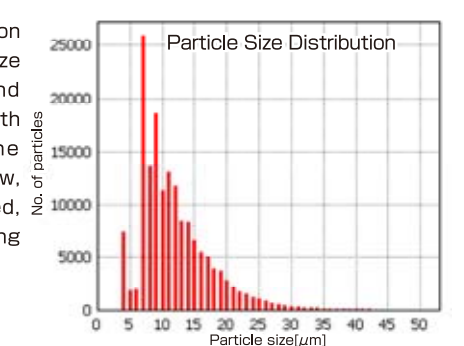


Measured Data

The density distribution is graphed with the gray-scale tone value on the horizontal axis, and the number of pixels having that gray-scale tone value on the vertical axis. The tone value range as 0 to 255 (8 bits). The yellow vertical line indicates the binarized threshold value. Clicking the line allows you to change it.



The particle size distribution is graphed with particle size on the horizontal axis and the number of particles with that particle size on the vertical axis. In the window, the graph can be enlarged, saved, or printed by clicking the histogram.

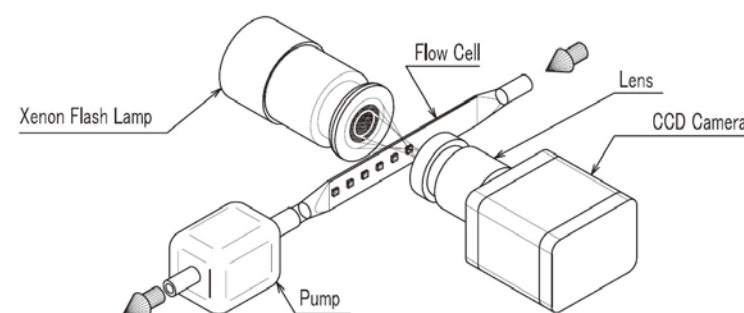


Visual imaging of underwater plankton with high-precision CCD camera and high-speed image processing, and automatic measurement of suspended sediment particle distribution and density

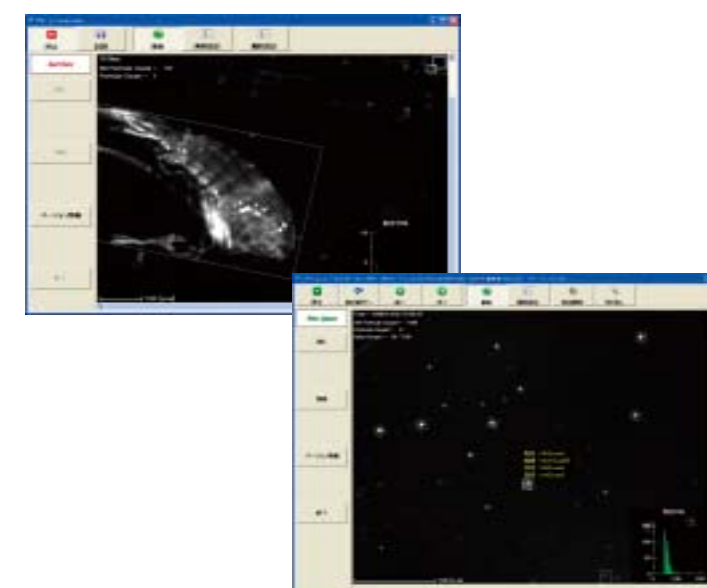
Imaging Principle

This instrument is a wired measuring device that takes an image of underwater zooplankton and suspended matter and automatically measures the corresponding shapes and volume via image processing. The instrument is compact in size, making use possible in a variety of environments, from onsite observation to the laboratory.

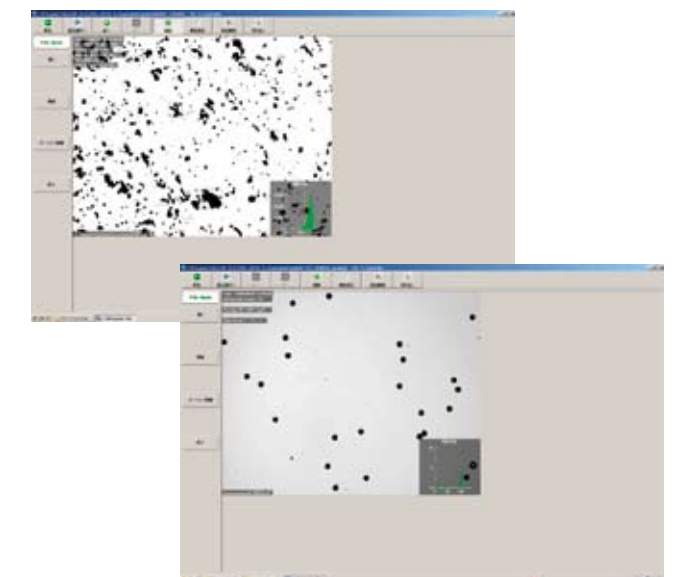
The measurement method employed is a dark field observation method. The instrument uses a black and white CCD camera equipped with a zoom lens, and emits a pulse light from in front of the lens for imaging. With this arrangement, a dark field image having a black background and a white subject is achieved. The measured sample flows through a flow cell positioned between the lens and light source, enabling the device to take continual static images the moment each sample passes in front of the lens. An open cell for suspended particle observation is also available.



Plankton Images



Sediment Particle Size Distribution Measurement



Miniature logger-type instruments

COMPACT SERIES

Temperature Salinity Depth

Features

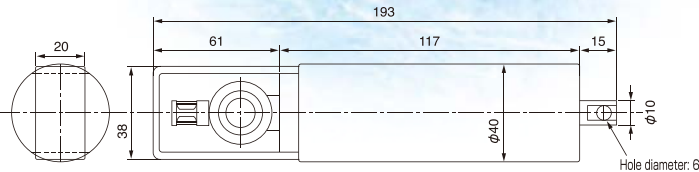
- ① Compact, light in weight, large capacity
- ② Built-in flash memory
- ③ Built-in calendar and time information
- ④ Interface not required
- ⑤ Built-in calibration coefficients

Overview

The COMPACT series is a series of compact, high-precision instruments with a built-in microcontroller used for continual observation. The series utilizes a 16-bit A/D converter and features a digital resolution equivalent to 1/65,000 of the measurement range, making highly accurate continual measurements possible. The maximum number of recorded data sets is 178,439, and the recording medium utilized is nonvolatile flash memory, thereby eliminating any loss in recorded data and improving reliability even if a power drop occurs.

All COMPACT series operations can be performed by directly connecting the terminal of the instrument main body with the serial port of a user PC using the RS-232C communication cable (accessory). The instrument main body is equipped with calendar and time information, simplifying measurement operations to simply observation parameter selection and measurement start time setup. The calibration coefficients of each sensor are also stored in memory.

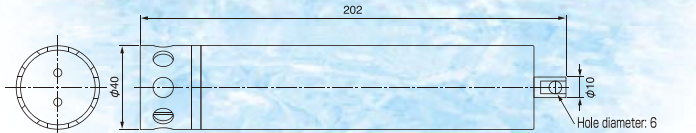
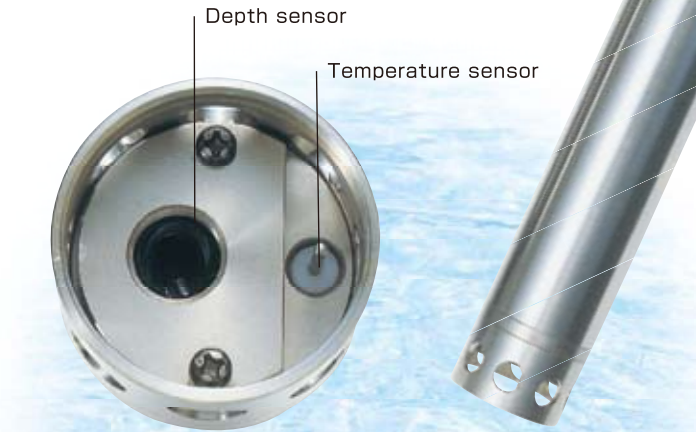
Data transfer after observation with this instrument is also extremely easy. The measurement start time and calibration coefficients are automatically transferred to data processing software, eliminating the need for troublesome coefficient management and making it possible to perform error-free data processing in a short period of time.



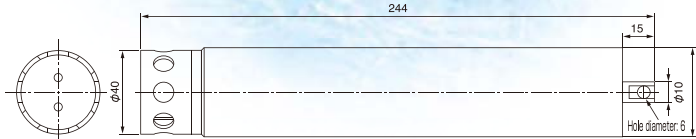
Miniature logger-type temperature and salinity meter COMPACT-CT ACT-HR

Measured item	Temperature	Electric conductivity
Sensor type	Thermistor	Electromagnetic induction cell
Measurement range	-5 to 40°C	0 to 60mS/cm
Resolution	0.001°C	0.001mS/cm
Accuracy	±0.05°C	±0.05mS/cm
Memory type	2MB flash memory	
Memory capacity	178,439 data sets (123 days with a one-minute interval)	
A/D conversion	16-bit digital conversion	
Measurement interval	1 sec, 1 min, 2min, 10min	
Power source / capacity	Lithium battery (CR2) / 750mAh	
Current consumption	42mA	
Housing material	Titanium (grade 2)	
Weight	Approx. 350g in air, 175g in water	
Pressure resistance	200m depth equivalent	

For dimensions, refer to the above figure.



Standard range

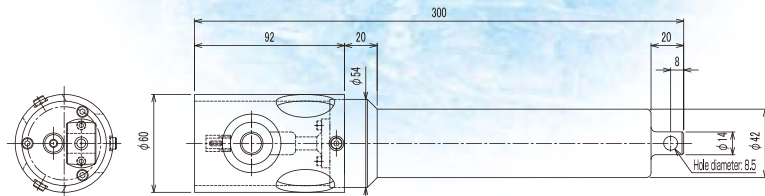


Deep-sea range

Miniature logger-type temperature and depth meter COMPACT-TD ATD-HR

Measured item	Temperature	Depth (pressure)
Sensor type	Thermistor	Semiconductor pressure sensor
Measurement range	-5 to 40°C	[Standard range] 25/40/100/200/500/1,000m [Deep-sea range] 2,000m
Resolution	0.001°C	Full scale/65,000
Accuracy	±0.05°C	±0.3%FS
Memory type	2MB flash memory	
Memory capacity	178,439 data sets (123 days with a one-minute interval)	
A/D conversion	16-bit digital conversion	
Measurement interval	1 sec, 1 min, 2min, 10min	
Power source / capacity	Lithium battery (CR2) / 750mAh	
Current consumption	35mA	
Housing material	Titanium (grade 2)	
Weight	[Standard range] Approx. 500g in air, 265g in water [Deep-sea range] Approx. 700g in air, 395g in water	
Pressure resistance	In accordance with each measurement range	

For dimensions, refer to the above figure.



Miniature logger-type temperature, salinity, and depth meter COMPACT-CTD Lite ACTD-CMP

Measured item	Temperature	Electric conductivity	Depth
Sensor type	Thermistor	Electromagnetic induction cell	Semiconductor pressure sensor
Measurement range	-5 to 40°C	0 to 60mS/cm	50/100/200 500/1,000m
Resolution	0.001°C	0.001mS/cm	1/65,000 of range
Accuracy	±0.02°C	±0.02mS/cm	±0.3%FS
Memory type	2MB flash memory		
Memory capacity	179,178 data sets		
A/D conversion	16-bit digital conversion		
Measurement mode	Continuous mode, Burst mode		
Measurement interval	0.5, 1, 2, 5, 10, 15, 20, 30 sec		
Burst interval	1 to 1,440 minutes		
No. of samples	1, 10, 15, 20, 30, 60, 120, 180, 240, 300, 600, 1,200		
Power source / capacity	Lithium battery (CRV3×2) 6Ah		
Current consumption	43mA		
Housing material	Titanium (grade 2)		
Weight	Approx. 1.0kg in air, 0.8kg in water		
Pressure resistance	1,000m depth equivalent		

For dimensions, refer to the above figure.

Miniature logger-type super low density and turbidity meter

COMPACT
LTW/LT

ATU6W-CMP ATU6-CMP

Overview

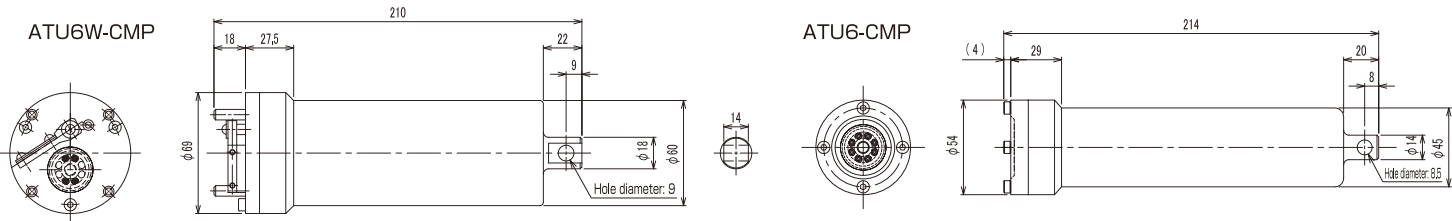
The Compact-LTW is a logger-type turbidity meter for long-term continuous observation particularly in low density regions. The sensor has a resolution of 0.0002FTU with its zero point within ±0.0005FTU as well. Offering stable performance, this instrument is capable of accurate turbidity measurement in open and deep seas where observation has been difficult to date. Two types of models are available: the shallow sea model (ATU6W-CMP) with a wiper function for fouling removal, and a deep sea model (AUT6-CMP) with a pressure resistance of 6,500m.

Main Unit Specifications

Model	ATU6W-CMP	ATU6-CMP
Measured item	Turbidity, battery voltage	
Sensor type *1	Infrared backscattering	
Measurement range *2	0 to 10FTU or 0 to 10, 10 to 100FTU (10 to 100FTU is with the added optional range)	
Resolution	0.0002FTU Note: The resolution with the 10 to 100FTU range is 0.002FTU.	
Accuracy	±0.002FTU or the measured value ±2 [%]	
Communication method	RS-232C	
Maximum no. of recorded data sets	179,178	
Memory type	2MB flash memory	
A/D conversion	16-bit digital conversion	
Measurement mode	Continuous mode, Burst mode, Real-time mode	
Measurement interval	0.5, 1, 2, 5, 10, 15, 20, 30 sec	
Burst interval	1 to 1,440 minutes	
No. of samples	10, 15, 20, 30, 60, 120, 180, 240, 300, 600, 1,200	
Warm-up time	10sec	
Power source / capacity	Size D lithium battery / 14Ah	Size C lithium battery / 7Ah
Current consumption	During measurement: 50mA During wakeup: 10mA During maximum wiper load: 450mA	During measurement: 90mA During wakeup: 10mA
Main material	Housing: Titanium (grade 2) Optical sensor: Epoxy resin	Housing: Ti-6Al-4V Optical sensor: Epoxy resin
Weight (including battery)	Approx. 1.1kg in air Approx. 0.6kg in water	Approx. 0.8kg in air Approx. 0.5kg in water
Pressure resistance	200m depth equivalent	6,500m depth equivalent
Other	With automatic cleaning function by wiper	High pressure resistance specifications

*1. The sensor structure differs for the model with a wiper and the model without a wiper.
*2. The 0 to 10FTU resolution range does not change even with the added optional range.
This device uses our turbidity reference device calibrated with formazin for calibration.

Dimensional Drawing



Miniature logger-type quantum meter

COMPACT
LW

ALW-CMP/AL30-CMP



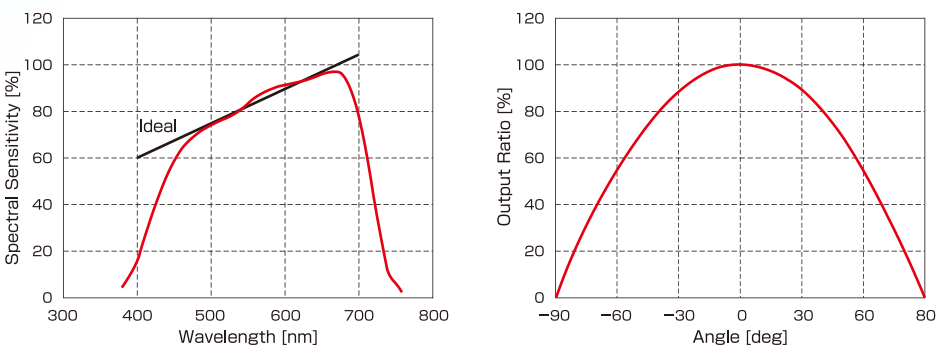
COMPACT LTD

For profile observation
Underwater quantum, temperature, depth

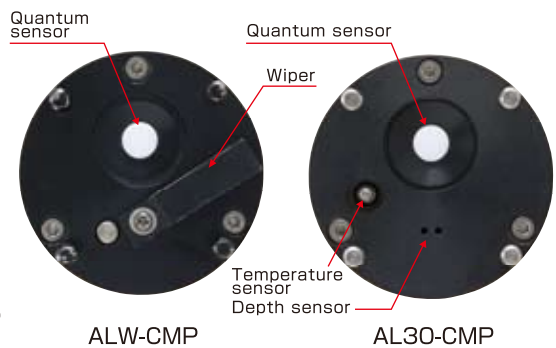
COMPACT LW

For long-term continuous observation
Underwater quantum, with wiper

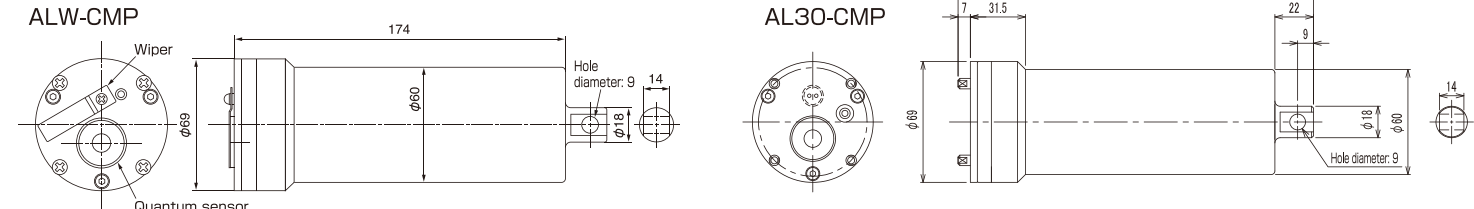
Spectral Sensitivity and Cosine Characteristics



Sensor Images



Dimensional Drawing



Super miniature underwater logger-type instrument

MDS-MkV

Temperature
Illuminance
Depth

Features

- ① Compact, light in weight, high capacity
- ② Utilizes flash memory
- ③ Built-in calendar and time information
- ④ Built-in calibration coefficients

The MDS-MkV series is a compact, high-precision intelligent datalogger series with a built-in micro-controller. The series utilizes a 12-bit A/D converter, resulting in a digital resolution of 1/4,096 of the measurement range, enabling measurement with higher accuracy. The maximum amount of recorded data is a high 512,000 data sets, and the recording medium used is nonvolatile flash memory, eliminating recorded data loss even in the event of a power drop, further improving reliability.

The MDS-MkV series is operated using a PC via a compact interface. The instrument main unit contains calendar and time information, simplifying setup to simply observation parameter selection and measurement start time setup. The calibration coefficient of each sensor is also

stored in the memory. With this series, data transfer after observation completion is also extremely easy. The measurement start times and calibration coefficients are automatically transferred to data processing software, eliminating the need for troublesome coefficient management and achieving error-free data processing in a short period of time.

Interface Specifications

Communication method	RS-232C
Dimensions	W94mm×H32mm×D156mm
Power source	Size AA battery (Qty 4)
Communication software	Windows(32bit)
Communicated information	Calendar/Time information settings Measurement interval settings Measurement start time settings Record data, Clear data



Super miniature logger-type temperature meter

MDS-MkV/T

Temperature Sensor Specifications

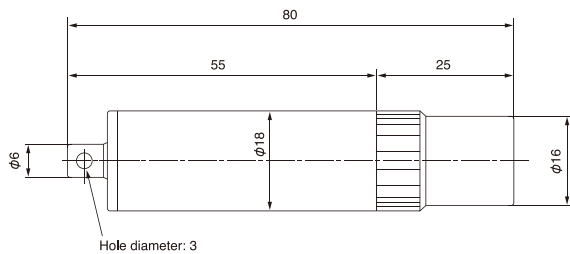
Type	Thermistor
Measurement range	−4 to 40℃
Resolution	0.015℃
Accuracy	±0.05℃

Hardware Specifications

Material	Titanium (grade 2)
Dimensions	φ18mm×80mm
Weight	Approx. 50g in air, 30g in water (including battery)
Pressure resistance	2,000m depth equivalent

Logger Specifications

Memory type	2MB flash memory
A/D converter	12-bit A/D converter
Maximum no. of data sets	512,000 data (355 days with a one-minute interval)
Measurement interval	1sec, 1min, 2min, 10min
Current consumption	70mA (during flash memory writing)
Power source	Lithium battery (Qty 1) (2CR1/3N)



Miniature logger type illuminance meter

MDS-MkV/L

Illuminance Sensor Specifications

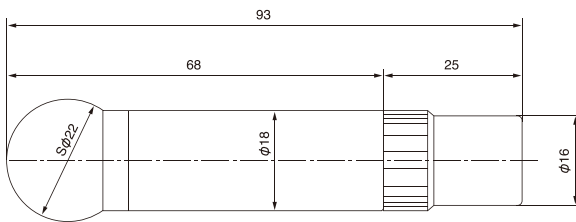
Type	Photodiode
Measurement range	0 to 2,000μm/㎡·sec
Resolution	1 μmol/s/㎡
Accuracy	±4%FS

Hardware Specifications

Material	Titanium (grade 2) (light-receiving area: Duracon resin)
Dimensions	φ18mm×93mm(light receiving area: φ22mm)
Weight	Approx. 50g in air, 30g in water (including battery)
Pressure resistance	500m depth equivalent

Logger Specifications

Memory type	2MB flash memory
A/D converter	12-bit A/D converter
Maximum no. of data sets	512,000 (355 days with one-minute interval)
Measurement interval	1sec, 1min, 2min, 10min
Current consumption	70mA (during flash memory writing)
Power source	Lithium battery (Qty 1) (2CR1/3N)



Super miniature logger-type depth meter

MDS-MkV/D

Depth Sensor Specifications

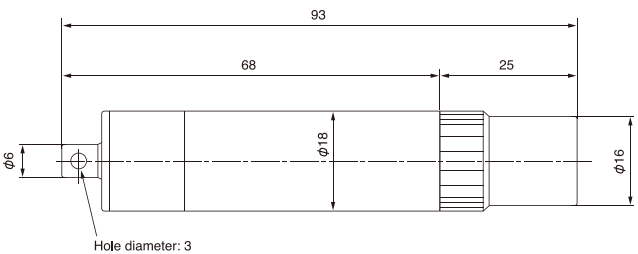
Type	Semiconductor pressure sensor
Measurement range	0 to 200/500/1,000m (3 types)
Resolution	0.05m (0 to 200m specification) 0.125m(0 to 500m specification) 0.25m (0 to 1,000m specification)
Accuracy	±1%FS

Hardware Specifications

Material	Titanium (grade 2)
Dimensions	φ18mm×93mm
Weight	Approx. 60g in air, 40g in water (including battery)
Pressure resistance	In accordance with depth sensor

Logger Specifications

Memory type	2MB flash memory
A/D converter	12-bit A/D converter
Maximum no. of data sets	512,000 (355 days with one-minute interval)
Measurement interval	1sec, 1min, 2min, 10min
Current consumption	72mA (during flash memory writing)
Power source	Lithium battery (Qty 1) (2CR1/3N)



Direct-reading temperature, salinity, and depth meter

ACTD-DF

Depth Temperature Conductivity



Sensor Specifications (Common Specifications)

Measured item	Depth	Temperature	Salinity (conductivity)
Sensor type	Semiconductor	Thermistor	Electromagnetic induction cell
Measurement range	0 to 100m	-5 to 40°C	0 to 40 (0 to 60mS/cm)
Resolution	0.01m	0.01°C	0.01 (0.01mS/cm)
Accuracy	0.3%FS	±0.02°C	±0.03 (±0.02mS/cm)

Overview

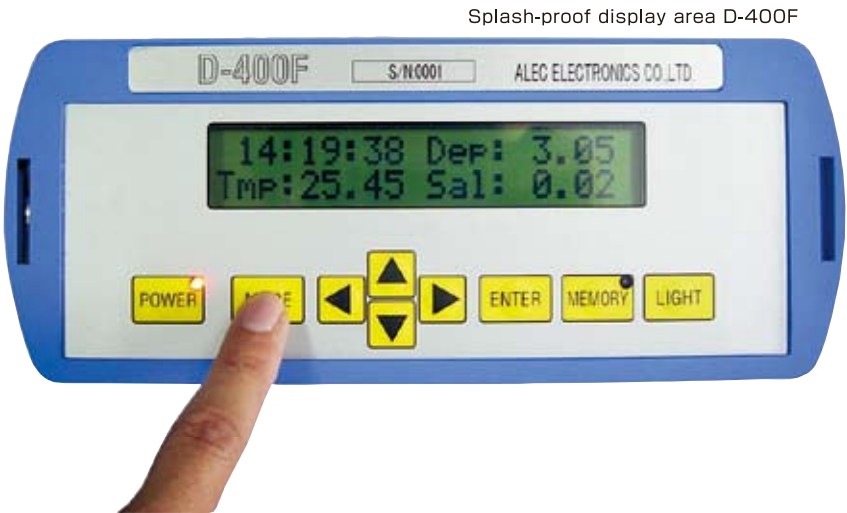
The ACTD-DF is a direct-reading water temperature, salinity, and depth meter. The dedicated display unit (D-400F) comprises a built-in 2MB flash memory, making it possible to automatically record measured data while checking the data on the LCD display. The meter adds calendar information to the logged data, simplifying data management. The panel surface touch buttons allow you to take measurements by performing simple operations, and the light switch makes the display extremely easy to view at night-time as well. This instrument enables spot measurements as well as vertical measurements when dropped. The device can be used in open sea as well as a wide variety of other sites, such as rivers, lakes, and marshes. A model without a built-in depth sensor is also available.

Display Area Specifications

Displayed items	Time information, depth, temperature, salinity (electric conductivity)
Memory	2MB flash memory, approx. 180,000 data sets
Power source	Size C dry alkaline battery cell (Qty 4) (for approx. 20 hours of use)
Material	ABS equivalent
Waterproof characteristics	JIS4 class equivalent
Dimensions	W240mm×D100mm×H95mm
Weight	Approx. 1.1kg (including batteries)
Other	Transfers logged data to external PC (with basic software)

Probe Specifications

Cable	Cable enforced with Kepler fiber (φ6.5mm, standard length: 50m, maximum: 200m)
Dimensions	φ42mm×300mm
Material	Titanium (grade 2)
Weight	Approx. 1kg in air (excluding cable), 0.8kg in water (excluding cable)
Pressure resistance	1,000m depth equivalent



Electromagnetic current meter for river use

AEM1-D

Velocity



Overview

The AEM1-D is an onsite portable 1-D electromagnetic velocity meter developed for simple and accurate measurement of the velocity of rivers and various waterways. The instrument can accommodate sites even at a shallow depth of 3cm. In comparison with conventional propeller current meters, this instrument is trouble free and extremely easy to operate and maintain, providing digital output of current velocities ranging from slow to fast. The AEM1-D features a new memory function that stores 255 measurement points, maximum, with calendar information. The instrument eliminates the need to enter information onsite in a logbook, allowing you to process the data from a PC indoors.

Sensor Specifications

Type	Electromagnetic induction
Measurement direction	1-D
Measurement range	0 to 5m/s
Resolution	0.002m/s
Accuracy	Measured value ±2%±0.005m/s
Minimum measured depth	3cm
Dimensions	φ30mm×64mm
Cable length	10m (Maximum 50m extension possible)
Pressure resistance	30m depth equivalent

Display Area Specifications

Display	LCD, 20 characters, 2 lines
Displayed information	Velocity (m/s)
Average time	Selectable from 1, 5, 10, 20, 40, 60sec
Memory capacity	2MB, recordable up to 255 blocks
Logged information	Block number, measured time, velocity, average time
External output	RS-232C output 1.Memory data transfer 2.Real-time data transfer
Power source	Size C dry alkaline battery (Qty 4) (For approx. 20 hours of use)
Dimensions	W240mm×D100mm×H95mm
Weight	Approx. 1.1kg
Material	Urethane resin
Waterproof level	JIS4 class equivalent

Measurement using extension support bar



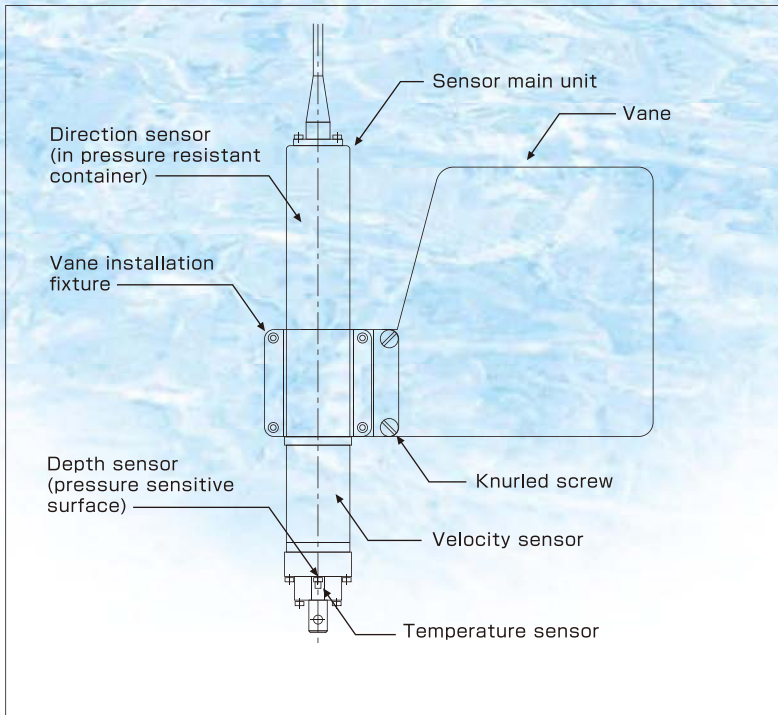
Measurement using vane



Direct-reading electromagnetic current meter

(with temperature and depth sensors) *AEM213-D*

Direction Velocity Temperature Depth



Sensor Probe Specifications

Cable	Cable reinforced with Kepler fiber (φ6.5mm, standard length: 50m)
Dimensions	φ42mm×307mm
Material	Titanium (grade 2)
Weight	Approx. 1.0kg in air (excluding vane), 0.65kg in water (excluding vane)
Pressure resistance	100m depth equivalent

Built-in Sensor Specifications

Measured item	Method	Measurement range	Resolution	Accuracy
Velocity	Electromagnetic induction	0 to 250cm/s	0.1cm/s	±1cm/s or 2%
Direction	Hole element compass	0 to 359.9°	0.1°	±2°
Depth	Semiconductor pressure sensor	0 to 50m	0.01m	±0.3%FS
Temperature	Thermistor	-5 to 40°C	0.01°C	±0.02°C

Overview

The AEM213-D is a direct-reading current direction and velocity meter comprising a 2-D electromagnetic velocity sensor and built-in compass. The instrument is provided with a depth sensor and temperature sensor as standard, enabling reliable velocity measurement at the target depth. The compact, light-weight unit is easily portable, enabling use in a variety of fields, such in the ocean as well on rivers, lakes, marshes, and dams. The easy-to-read liquid crystal display is provided with a memory function. Observed data are recorded onsite and then transferred to a PC, making the various calculation processes easy to do. The power source is a size C alkaline battery, allowing 10 hours of observation. External AC/DC power source input is also possible.



Display Area Specifications

Displayed items	Direction, velocity, temperature, depth
Memory	2MB flash memory, approx. 180,000 data sets
Power source	Size C dry alkaline battery (Qty 4) (for approx. 10 hours of use)
Quality	ABS equivalent
Waterproof performance	JIS4 class equivalent
Dimensions	W240mm×D100mm×H95mm
Weight	Approx. 1.1kg (including batteries)
Other	Printer (option)

Underground water flow direction and velocity meter *GDF3A/4*

A borehole current direction and velocity meter that enables easy observation of underground water flow

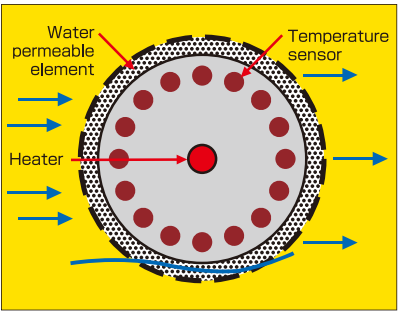
Velocity Direction Pressure

Features

- ① Enables measurement of underground water flow direction and velocity from a single observation well
- ② Enables use even with small (inner diameter: 50mm or greater) boring holes
- ③ Enables measurement even at a depth of 200m with GFD4
- ④ Compact and light in weight; optimum for field surveys in the open air and in mountainous regions
- ⑤ Enables measurement of current velocities of approximately 0.01 to 1.0cm/min
- ⑥ Enables long-term observation with a dedicated logger

Measurement Principle

The underground water flow direction and velocity sensor area is tubular in shape with a heater embedded at the center and 16 sensors placed in circular arrangement around the heating element. The probe is embedded in the underground stratum where there is uniform underground water flow from the direction orthogonal to the probe. Once embedded, the heater inside the probe heats up, and the 16 temperature sensors measure the rise in temperature. Due to heat transfer characteristics, the temperature decreases when the velocity is high, and conversely increases when the velocity is low. The sensors facing the water flow decrease in temperature, and the sensors on the opposite side increase in temperature. The underground water flow direction and velocity are identified from the difference between the highest temperature and the lowest temperature of the 16 sensors.

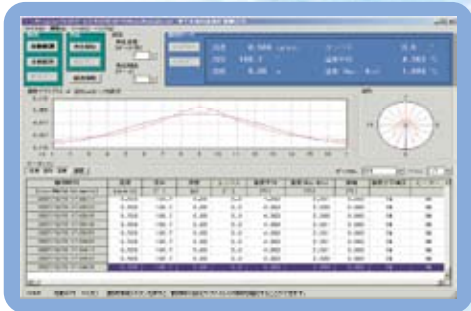


[Note regarding models]

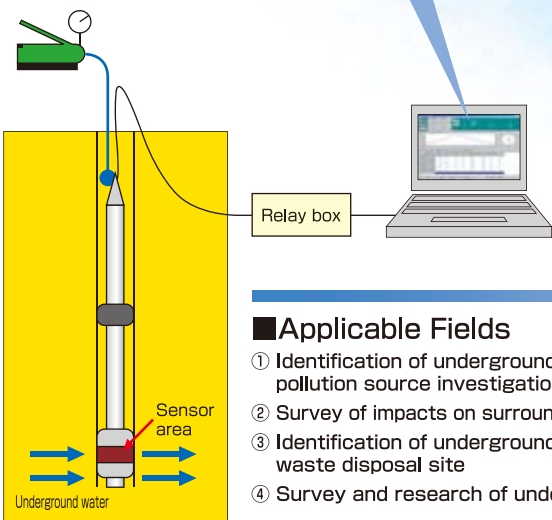
GFD3A does not come with a compass. As a result, the current direction requires correction based on the installation direction of the detector. GFD4 is provided with a built-in compass and pressure sensor inside the detector.

Main Unit Specifications

Item	Specifications
Measurement range	Direction: 0 to 360° Velocity: 0.01 to 1.0cm/min
Measurement accuracy	Direction: ±10° Velocity: ±10% or 0.01cm/min
Measurement function	Direction: 360° circular display Velocity: Digital display
Output	RS232C
Power source	100 to 240V AC
Cable length	30m to 150m
Shape	φ34mm×410mm
Pressure resistance	200m depth equivalent



Instrument Configuration Diagram: GFD4



Applicable Fields

- ① Identification of underground water flow during underground water pollution source investigation
- ② Survey of impacts on surrounding wells of construction sites or the like
- ③ Identification of underground water flow and velocity at industrial waste disposal site
- ④ Survey and research of underground water at riverbeds and the like

Electromagnetic current meter and water level meter for laboratory use

Velo
city Level Wave
Height

for Laboratory use



2-D electromagnetic velocity sensor
ACM2-RS
XY digital output
Sensor diameter: 6mm



3-D electromagnetic velocity sensor
ACM3-RS
XYZ digital output
Sensor diameter: 20mm



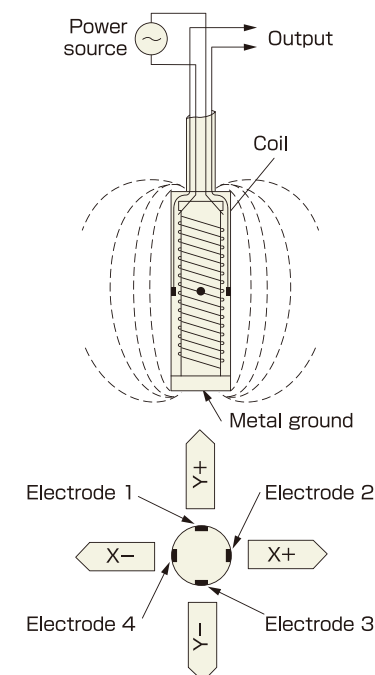
High sensitive water level sensor
ACH600-RS (ACH300-RS)
Capacitance digital output
Sensor length: 700mm (350mm)

Overview

Our electromagnetic velocity sensors for hydraulics model testing with a 30-year track record have undergone a complete model change. All sensors in our new sensor series offer digital output, a high-speed sampling rate, and insusceptibility to electromagnetic noise. We also added a new highly sensitive, capacitance water level sensor.

With the new system, a maximum of four different sensors can be connected to the compact interface, enabling simultaneous recording on a single PC. Additionally, the system can provide analog output as well, as necessary.

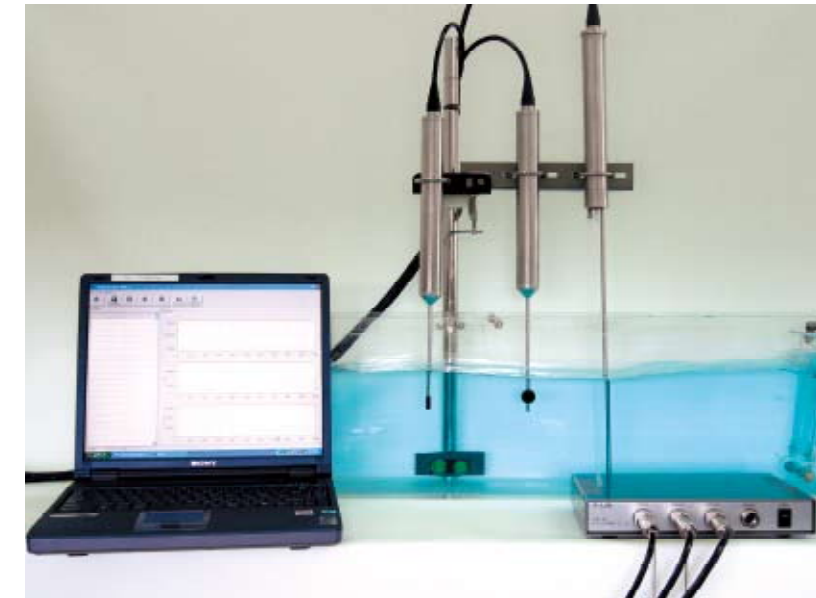
While conventional water level and wave height meters cannot be used near velocity sensors, our new interface eliminates any effects from interference noise, even at a distance of about 5cm, owing to its special isolated circuit, resulting in an innovative system capable of achieving highly accurate data.



When velocity components X and Y are measured, a magnetic field is produced by the coil, and the electromotive force is measured at electrodes 1 and 3 for velocity component X, and at electrodes 2 and 4 for velocity component Y.

The true velocity V is found by the following equation:

$$V = \sqrt{X^2 + Y^2}$$



The 2-D and 3-D electromagnetic velocity sensors and water level and wave height sensor are arranged 10cm apart from each other to measure a 0.5sec cycle wave-induced flow.

Specifications

	2-D Velocity Sensor	3-D Velocity Sensor	Water Level and Wave Height Sensor
Sensor type	ACM2-RS	ACM3-RS	ACH300-RS (ACH600-RS)
Measured items	Velocity in two horizontal directions (X and Y)	Velocity in three horizontal and vertical directions (X, Y, and Z)	Water level and wave height
Measurement range	Each axis: ± 250 cm/s	Each axis: ± 250 cm/s	Standard: 300mm (600mm)
Measurement accuracy	$\pm 2\%$ or 0.5cm/s	$\pm 2\%$ or 0.5cm/s	$\pm 0.5\%$ /FS
Resolution	0.1cm/s	0.1cm/s	0.1mm
Zero point stability	Within 0.1cm/s	Within 0.1cm/s	—
Sensor response time	0.05, 1, 5 sec (switching type)	0.05, 1, 5 sec (switching type)	Response possible for 5Hz wave
Sampling rate	15 to 70Hz (in accordance with number of sensors)	15 to 60Hz (in accordance with number of sensors)	15 to 80Hz (in accordance with number of sensors)
Digital output signal	RS232C	RS232C	RS232C
Analog output signal	-1V to +1V	-1V to +1V	-1V to +1V
Power source	12V DC	12V DC	12V DC
Overall dimensions	Maximum diameter: 34mm, Total length: 420mm	Maximum diameter: 34mm, Total length: 420mm	Maximum diameter: 35mm, Total length: 664mm
Detector area dimensions	$\phi 6$ mm $\times$ 18mm	$\phi 20$ mm (spherical shape)	Standard: 350mm (700mm)
Detector area pressure resistant depth	5m/24hrs	5m/24hrs	—
Cable	$\phi 6$ mm polyurethane outer sheath, 6-core cable	$\phi 6$ mm polyurethane outer sheath, 6-core cable	$\phi 6$ mm vinyl chloride outer sheath, 5-core cable

Interface

Model	Maximum No. of Connected Sensors	Power Source	Dimensions
ACM-4IF	4	100 to 120V AC or 200 to 230V AC (factory setting)	260mm $\times$ 190mm $\times$ 40mm

Turbulence ocean microstructure acquisition profiler

TurboMAP

- Turbulence
- Temperature
- Salinity
- Pressure
- Acceleration
- Chlorophyll
- Turbidity

Overview

Turbulence microstructures are extremely critical in the understanding of small-scale ocean structure changes as well as global scale physical mechanisms, such as ocean circulation. TurboMAP is a free-falling or ascending-type profiler developed with the guidance of Tokyo University of Marine Science and Technology and the University of Victoria, Canada, that excels in turbulence microstructure measurement.



TurboMAP-L
(For open ocean)

TurboMAP-L is capable of measuring turbulence microstructures from a depth of 10m to a depth of 500m, at the dropping rate of 0.5m/sec. At the top of the 2.5m-long unit, the profiler is equipped with two microstructure shear probes for turbulence measurement and the super fast responding temperature sensor FPO-7, which are the distinctive features of this instrument. In addition, the profiler is provided with the basic sensors for oceanographic surveys, including temperature, salinity, depth, chlorophyll, turbidity, and triaxial acceleration sensors. The data acquired from these sensors are monitored and recorded in real-time on a PC via a submergible cable.

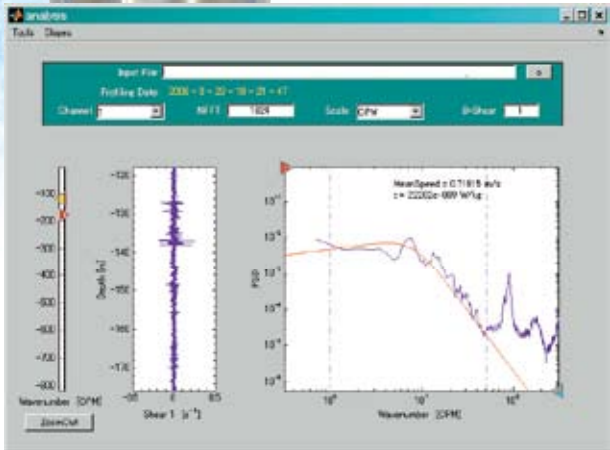


Measured items

- Horizontal velocity and vertical shear
- Fast temperature
- Platinum temperature
- Electric conductivity (salinity)
- Pressure (depth)
- Acceleration on X, Y, and Z axes
- Chlorophyll
- Turbidity

Calculation Results

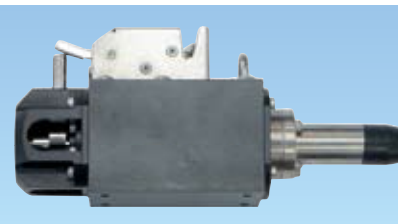
- Turbulence energy dissipation factor
- Seawater density
- Buoyancy frequency
- Descending (ascending) velocity



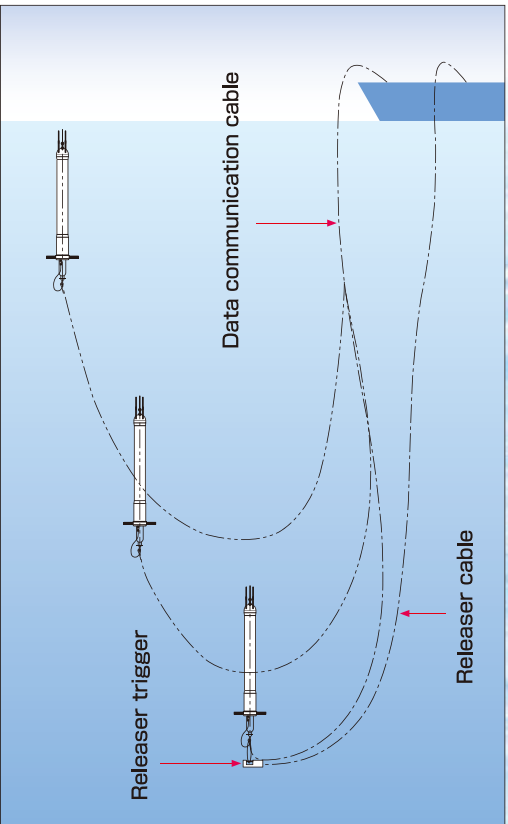
The dedicated software that comes with this instrument is capable of measuring turbulence as well as analyzing the measured data in detail. While turbulence energy dissipation factor calculations require advance technology, this software allows you to visually find the dissipation factor relatively easily.

TurboMAP-9
(For coast)

TurboMAP-9 is mainly for coastal regions. In coastal regions with a depth of up to 200m, many mysterious phenomena still remain, including physical mechanisms as well as oxygen and nutrient circulation. TurboMap-9 serves as a valuable tool that will bring us one step closer to understanding such phenomena. This instrument is capable of downward profiling as well as upward profiling for surveying microstructure near the water surface. For upward profiling, the profiler employs syntactic foam (buoyant) and weights in the main body. Both the downward and upward profiles can be monitored and recorded in real-time on a PC via a submergible cable.



Releaser



Specifications

Measured item		Sampling rate	Measurement range	Accuracy	Resolution
Horizontal velocity and vertical shear		512Hz	0 to 10S ⁻¹	5%	1×10 ⁻⁴ S ⁻¹
Fast temperature		512Hz	-5 to 45℃	±1×10 ⁻² ℃	<1×10 ⁻⁴ ℃
Temperature		64Hz	-5 to 45℃	±5×10 ⁻² ℃	1×10 ⁻³ ℃
Electric conductivity (salinity)		64Hz	0 to 7S/m	±5×10 ⁻³ S/m	2×10 ⁻⁴ S/m
Pressure (depth)	L type	64Hz	0 to 500dbar	±0.2%FS	1×10 ⁻² dbar
	9 type	64Hz	0 to 200dbar	±0.2%FS	5×10 ⁻³ dbar
Acceleration (X, Y, Z axes)		256Hz	±2G	±1%FS	5×10 ⁻⁴ g
Fluorescence intensity		256Hz	0 to 100ppb	0.5ppb or ±1%	5×10 ⁻³ ppb
Turbidity		256Hz	0 to 100ppm	1ppm or ±2%	5×10 ⁻⁴ ppm

Name	TurboMAP-L	TurboMAP-9
Dimensions	(L)2,508mm×(OD)114mm/200mm(buoyant area)	(L)1,790mm×(OD)122mm/200mm(buoyant area)
Weight	Approx. 42kg	Approx. 24kg
Maximum depth	500m	200m
Pressure resistant housing	Titanium	HCR treated aluminum



TurboMAP-9

High-precision, direct measurement of river flow. Central management of low to high water levels.

ATENAS flow observation system

Velo
city

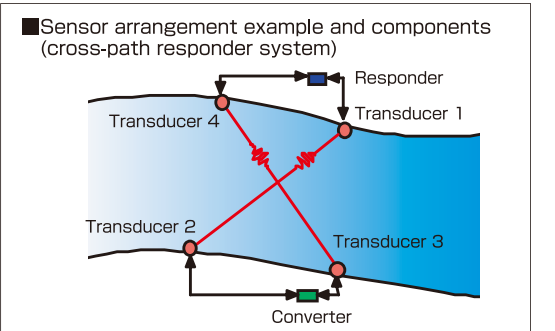
Flow

Ministry of Land, Infrastructure, and Transport
New Technology Information System (NETIS)
Registration No.: KK-050041-A

ATENAS flow observation system for rivers



Installation example



By enabling high-precision direct measurement of river flow using an optimum design for the application, ATENAS advances water conservation and supply management. ATENAS can be used for ongoing flow observation during flooding as well.

POINT 1 High-precision flow identification

Unlike conventional flow observation methods that employ an HQ equation based on water level, ATENAS utilizes our proprietary ultrasound digital processing to directly measure the average river velocity with high accuracy. When the flow calculations are performed using SIMK® (option), ATENAS achieves even higher accuracy, making it possible to achieve high-precision flow measurement even during flooding, something that has been difficult to achieve to date with conventional flow observation methods.

POINT 2 Significantly expanded flow observation range

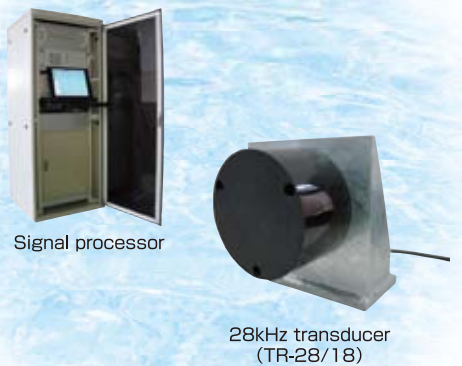
With the use of low-frequency, high-output ultrasound transducers, ATENAS is unsusceptible to underwater suspended matter and fouling, enabling measurement during flooding as well. The system is capable of accommodating a maximum river width of 1,000m.

POINT 3 Enhanced support of drift current and partial reverse current

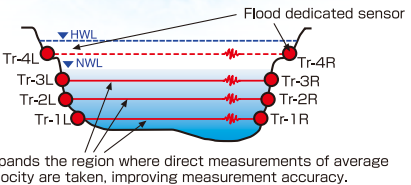
With the use of low-frequency, high-output ultrasound transducers, ATENAS achieves a sensor arrangement with plenty of room to spare, improving accuracy and maximizing the removal effect of drift error. With the sensors arranged on multiple levels (multipath type), ATENAS accommodates deep sea directed drift currents, such as tidal rivers, as well.

■ ATENAS Flow Observation System: Common Specifications

Application	For waterways and streams	For rivers	
Converter model	KTT-200	FTT-200	FTT-28
Applicable river (waterway) width	1 to 20m	10 to 50m	30 to 1,000m
Transmission frequency	200kHz	200kHz	28kHz
Maximum transmission output	600W	2kW	2kW
Sensor arrangement	8 sensors, maximum / 2 waterways, maximum	8 sensors, maximum (single path: 8 depth, cross path: 4 depth)	8 sensors, maximum (single path: 8 depth, cross path: 4 depth)
Velocity measurement range	-20m/s to +20m/s	-10m/s to +10m/s	-10m/s to +10m/s
Data storage	Built-in data logger function (standard: 2 years of data)		
Interface	VGA, Mouse / KB, USBx4, RS-232Cx2, Ethernetx2		
Input	Analog (4 to 20mA): 4 points		
Output	Analog (4 to 20mA): 2 points Contact output: 2 points, open connectors: 2 points		
Operating environment	0°C to +50°C (non-condensing)	0°C to +50°C (non-condensing)	5°C to +35°C (non-condensing)
Power source	12V DC	12V DC	90V to 260V AC 50/60Hz
Applicable transducers	TR-200 / 8	TR-200 / 5	TR-28 / 18
Frequency	200kHz	200kHz	28kHz
Maximum output	600W	2kW	2kW
External dimensions	φ70mm×40mm	φ107mm×68mm	φ183mm×142mm
Weight	Approx. 1.3kg	Approx. 2.0kg	Approx. 8.4kg
Hemispherical housing dimensions	φ218mm×109mm	φ340mm×170mm	φ440mm×220mm



Multi-path system
(Example with sensor pairs at three levels for low water level management, and one sensor pair at one level for flood observation)



■ Meets variegated needs through options

- Provides the optimum flow meter for the observation target, from a simple flow meter for small waterways to designs with sensor arrangements based on advance measurements for large rivers.
- Provided with a remote monitoring function, realizing an operation environment on a remotely connected PC that is substantially the same as onsite. Enables installation status monitoring, operation, and waveform monitoring.
- Supports connection to telemeters and optical cables as well. Contact the Ocean & River Instruments Division, JFE Advantech, for details.

■ Installation Case Examples



ATENAS flow meter for small tributaries and streams



Example of sloping revetment



Elevator-type stand and converter

Compact, inexpensive measuring instruments for streams, based on large river flow meter know-how. Optimized flow management for waterways and streams, such as water used for hydroelectric power, agriculture, and water supplies.

POINT 1 Realization of high-precision flow observation

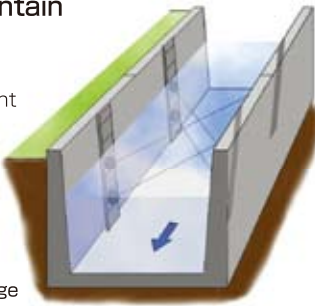
ATENAS allows you to realize your optimum system configuration.

- Supports complex flows with variegated sensor variations (single path, cross path, multi-level arrangement)
- Enables reverse flow observations
- Enables high-precision flow observation with SIMK® (option) without further combination with other methods, even for complex shaped waterways

POINT 2 Easy to install, adjust, and maintain

ATENAS utilizes an elevator-type stand (option).

- Equipped with a sensor height adjustment mechanism
- Enables sensor angle adjustment during sloping revetment
- Provides a built-in immersion-type water level meter
- Offers enhanced maintainability with its sensor pull-up mechanism

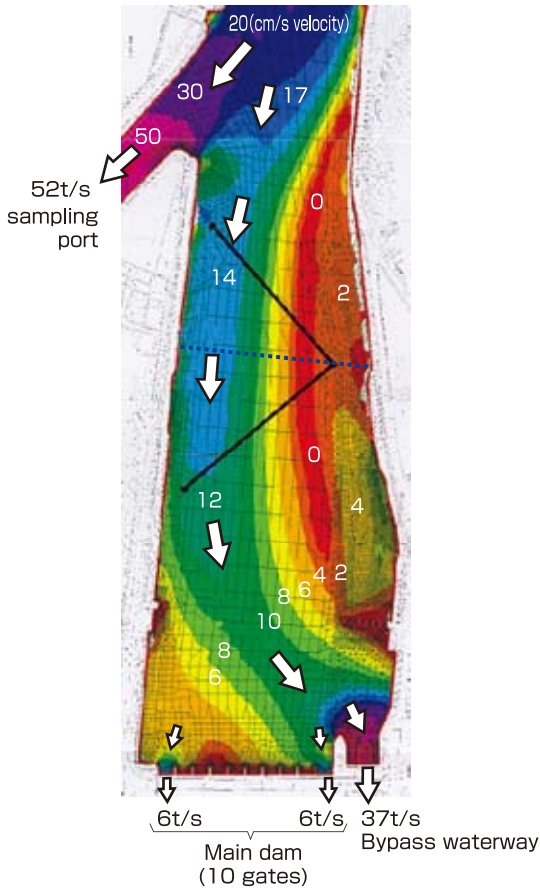


Installed image

High precision method based on river velocity distribution analysis

SIMK[®]

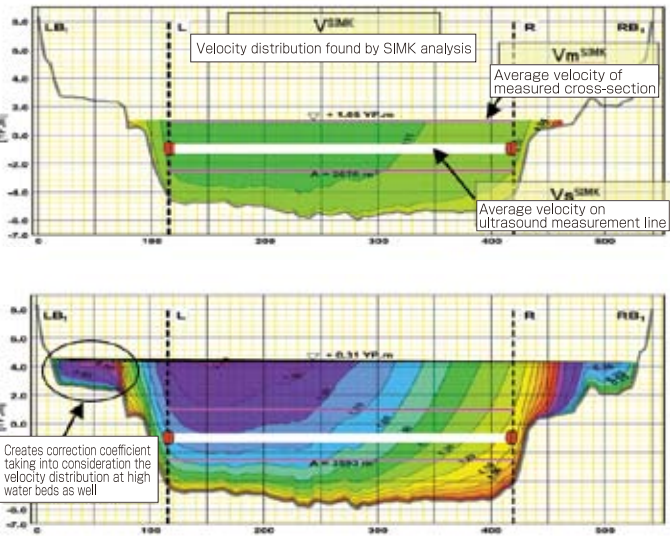
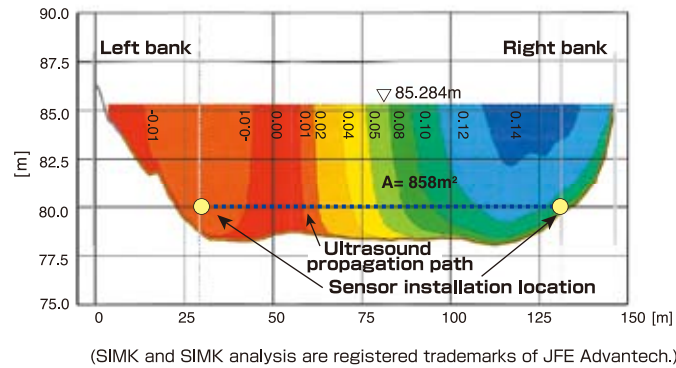
Velocity distribution diagram based on SIMK analysis[®]



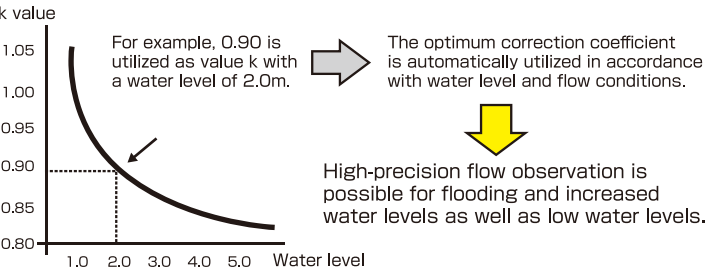
High-precision correction method using SIMK analysis[®] based on FEM analysis (finite element method)

- POINT 1** A tool that further enhances the accuracy of measured flow
This tool determines correction coefficients from the cross-sectional velocity distribution found by SIMK analysis[®] based on numeric simulation. By applying the correction coefficients to the data measured by the river flow meter, the instrument measures flow with even greater accuracy.
- POINT 2** Prediction of flood velocity distribution
This instrument simulates various flow states in advance, including floods never experienced, and determines the optimum correction coefficient for each flow. The instrument does not require combination with (adjustment using) existing flow observation techniques, making observation immediately after flow meter installation possible.
- POINT 3** Elimination of adjustment work after installation
This instrument determines correction coefficients in advance through numeric simulation, allowing you to execute flow observations immediately after installation without performing any adjustment work.

Example of cross-sectional velocity distribution derivation (dotted area in figure below)



- Correction coefficient** Calculates the ratio of the average velocity of the measured cross-section to the average velocity on the ultrasound measurement line from the velocity distribution found by numeric simulation
Correction coefficient $k = V_{mSIMK} / V_{sSIMK}$
- Velocity** Multiplies the velocity measured by ultrasound by the correction coefficient
Cross-sectional average velocity $V_m = V_s \times k$
- Flow** Multiplies the identified average velocity by the cross-sectional area
Flow $Q = V_m \times A$



Sediment movement observation system

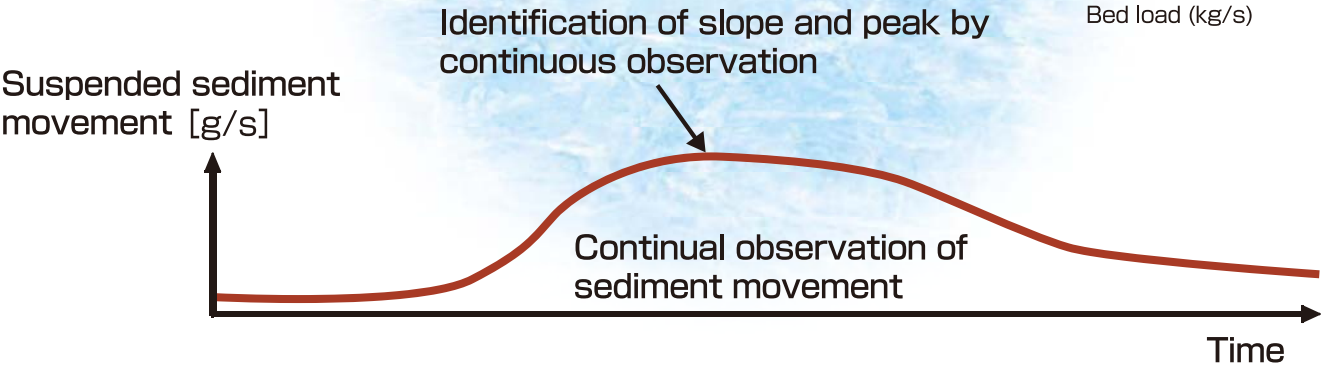
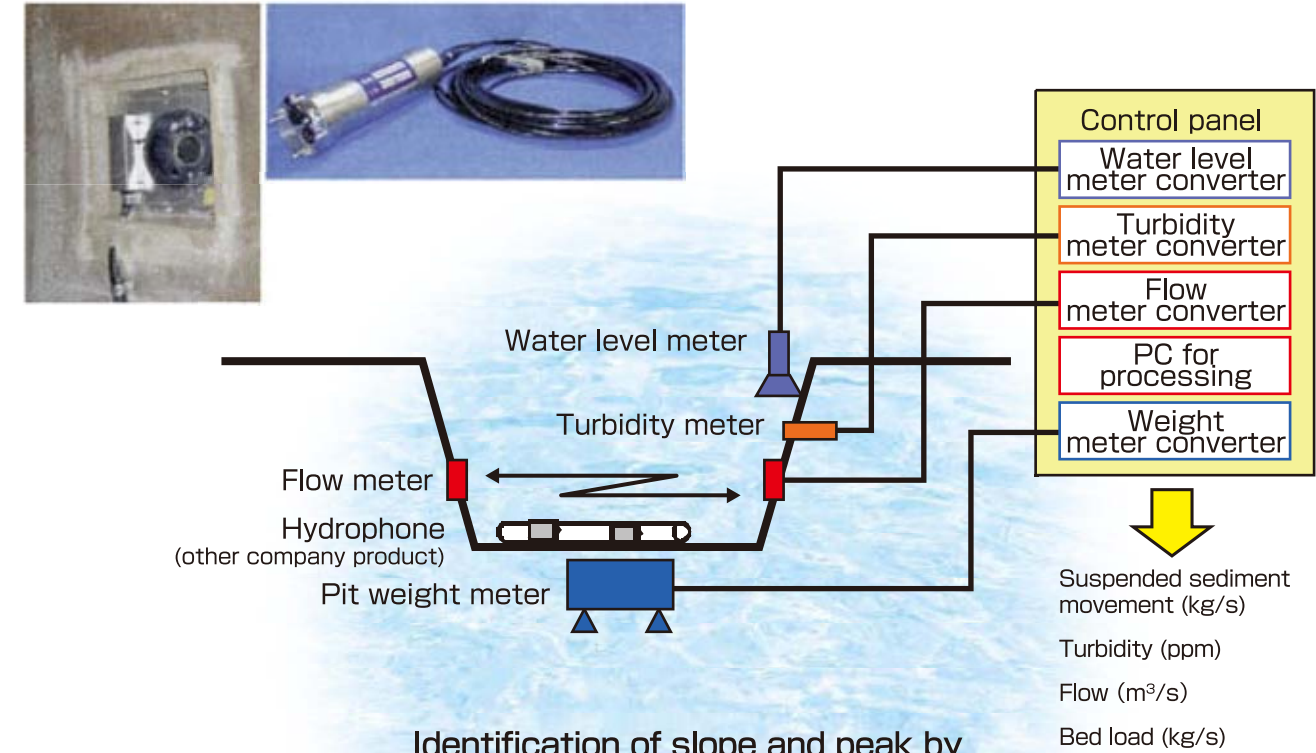
Turbidity Flow Suspended Sediment Movement Bed Load

Continually measures flow and turbidity, measuring the suspended sediment required for comprehensive sediment control. Utilizes pit load cells, making bed load measurement possible as well.

Calculating Suspended Sediment Movement

The suspended sediment movement (flux) is obtained by multiplying the suspended sediment content by the flow quantity (measured).
 $V(t) = D(t) \times Q(t) / D(t) - \text{Turbidity} \times \text{Conversion coefficient (turbidity function: From sampled water analytical data)}$
[V: Suspended sediment movement, D: Suspended sediment content, Q: Flow quantity, D: Suspended sediment content [g/l].

System Images



No.	Device Name (Principle)	Model	Specifications (Range)	Output Item	100V
①	ATENAS flow observation system (ultrasound propagation time difference method)	FTT-200 FTT-28	0 to ±10m/s	①Total width average velocity[m/s] ②Flow[m³/s]	Required
②	Medium/High density turbidity meter (reflected light method)	ATU75W-USB/CAR	Up to 100,000ppm	①Turbidity [ppm] (Kaolin calibration)	—
③	Water level meter (immersion type pressure method)	FL-20C, SL-180C	0 to 10m	①Water level[m]	Required
④	Particle counter (image processing method)	PIC-V	About 5μm to 500μm	①Particle distribution	Required
⑤	Pit weight meter (load cell)	HR/HRII	0 to 100t *Model with 100t or greater also available.	①Pit weight[kg]	Required